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MAKAROV, Ye.V.

Using helicopters in construction and assembling work. Prom. stroi. 41 no.2:23-25 F '64. (MIRA 17:3)

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MAKAROV, Ye.V., inzh.

Using helicopters in construction. Mont. i spets. rab. v stroi. 23 no.9:26-29 S '61. (MIRA 14:9)
(Helicopters) (Building machinery)

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Makarov, Ye.V.

MAKAROV, Ye.V.

Corrosion of metal lattice masts. Khim. prom. no.6:375-376 S '57. (MIRA 11:1)

(Corrosion and anticorrosives)
(Lightning protection)

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

MAKAROV, Ye. V.

Preventing cave formation in gypsum beds. Petent U.S.S.R. 77,971, Dec.31, 1949.
(CA 47 no.20:10816 '53)

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

MAKAROV, Ye.M., inzh.

Use of aluminum in the manufacture of chemical apparatus. Mont. i spets. rab. v stroi. 24 no.4:13-15 Ap '62. (MIRA 15:7)

1. Chernorechenskiy khimicheskiy zavod imeni M.I. Kalinina.
(Chemical plants) (Aluminum, Structural)

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MAKAROV, Ye.V. (Dzerzhinsk); SVETLANOV, N.D. (Dzerzhinsk)

Using reinforced zones in the foundations and walls of stone buildings built on a peat bog. Osn., fund.i mekh.grun. 4 no.4:12-13 '62. (MIRA 15:8)
(Oka Valley--Building, Stone)

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

MAKAROV, Ye.V. (Dzerzhinsk)

Pipeless laying of water pipes in peat bogs. Vod. i san. tekh. no.2:33-35 F '61. (MIRA 14:7)
(Oka Valley--Water pipes)
(Peat bogs)

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KIRKINSKIY, V.A.; MAKAROV, Ye.S.

UO_2 - PbO_2 system. Zhur.neorg.khim. 10 no.8:1872-1876 Ag '65. (MIRA 19:1)

1. Submitted September 17, 1964.

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

LIPOVA, I.M.; KUZNETSOVA, G.A.; MAKAROV, Ye.S.

Study of the metamict conditions of zircons and cyrtolites. Geokhimiia no.6:681-694 Je '65. (MIRA 18:7)

1. Vernadsky Institute of Geochemistry and Analytical Chemistry, Academy of Sciences, U.S.S.R., Moscow.

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

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KHALILOV, A.D.; MAKAROV, Ye.S.; MAMEDOV, Kh.S.; P'YANZINA, L.Ya.

Crystalline structure of the minerals of the murmanite-lomonosovite group. Dokl. AN SSSR 162 no.1:179-182 My '65. (MIRA 18:5)

1. Institut khimii AN AzerSSR i Institut geokhimii i analiticheskoy khimii im. V.I.Vernadskogo AN SSSR. Submitted November 14, 1964.

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KHALILOV, A.D.; MAMEDOV, Kh.S., MAKAROV, Ye.S.; P'YANZINA, L.Ya.

Crystalline structure of murmanite. Dokl. AN SSSR 161 no.6:
1409-1411 Ap '65. (MIRA 18:5)

1. Institut khimii AN Azerbaydzhanskoy SSR i Institut geokhimii i analiticheskoy khimii im. V.I.Vernadskogo AN SSSR. Submitted November 14, 1964.

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

KUZNETSOV, L.M.; KIRKINSKIY, V.A.; MAKAROV, Ye.S.

Interaction of uranium dioxide with lead monoxide. Zhur. neorg. khim. 9 no.5:1187-1196 My '64. (MIRA 17:9)

1. Institut geokhimii i analiticheskoy khimii imeni V.I. Vernadskogo AN SSSR.

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KHALILOV, A.D.; MAKAROV, Ye.S.

X-ray study of the lomonosovite-murmanite group. Geokhimia no.7: 673-677 Jl '63. (MIRA 16:9)

1. Vernadsky Institute of Geochemistry and Analytical Chemistry Academy of Sciences, U.S.S.R., Moscow.
(X-ray crystallography)

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

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MAKAROV, Ye.S.; ANIKINA, L.I.

Crystal structure of umohite $[UMoO_6(H_2O_2)_2].2H_2O$. Geokhimiia no.1:15-22 Ja '63. (MIRA 16:9)

1. Vernadsky Institute of Geochemistry and Analytical Chemistry, Academy of Sciences, U.S.S.R., Moscow.
(Umohoite crystals)

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

SHCHERBINA, V.V.; NAUMOV, G.B.; MAKAROV, Ye.S.; GERASIMOVSKIY, V.I.; YERMOLAYEV, N.P.; TARASOV, L.S.; TUGARINOV, A.I.; BARSUKOV, Vik.L.; SOKOLOVA, N.T.; KOCHENOV, A.V.; GERMANOV, A.I.; ZNAMENSKIY, V.L., red.izd-va; VINOGRADOV, A.P., akademik, red.; POLYAKOVA, T.V., tekhn.red.

[Essential features of uranium geochemistry] Osnovnye cherty geokhimii urana. Pod red. A.P.Vinogradova. Moskva, Izd-vo AN SSSR, 1963. 350 p. (MIRA 16:10)

1. Akademiya nauk SSSR. Institut geokhimii i analiticheskoy khimii.

(Uranium)

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Solid solutions in the quasi-binary cross-sections of the ternary systems of diagrams of magnesium with group IV elements. K. A. Bol'shakov, Ye. S. Makarov, Ye. A. Sokolova, V. I. Fistul', V. K. Prokof'yeva.

Report presented at the 3rd National Conference on Semiconductor Compounds, Kishinev, 16-21 Sept 1963

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

MAKAROV, Ye.S.; LIPOVA, I.M.

X-ray examination of thorianites, uranothorianites, and aldanites. Geokhimiia no.7:583-589 '62. (MIRA 15:7)

1. V.I. Vernadskiy Institute of Geochemistry and Analytical Chemistry Academy of Sciences, U.S.S.R., Moscow.
(Thorium oxides)
(X-ray crystallography)

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

25718

S/020/61/139/003/017/025
B103/B226

The homologous series of uranium...

ASSOCIATION: Institut geokhimii i analiticheskoy khimii im. V. I. Vernadskogo Akademii nauk SSSR (Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy of the Academy of Sciences USSR)

PRESENTED: February 6, 1961, by A. P. Vinogradov, Academician

SUBMITTED: February 1, 1961

Card 6/6

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25718 S/020/61/139/003/017/025
B103/B226

The homologous series of uranium...

oxides and their atomic arrangement. The author is of the opinion that there exists such a relationship which is to be detected by crystallochemists. Also, the "molecules" U_nO_{2n+2} should be sought in order to obtain a clear conception of the chemical character of homology in this case. Finally, the author notes that the definition of this homology offers a new way of explaining the chemical nature of berthollides which are similar to the oxides having a varying composition $UO_{2.0-2.25}$.

Taking account of the homologous rule, these berthollides cannot be understood any longer as "phases of varying composition" or as a "continuous set of compounds". The new data call for a revision of opinions and indicate that the ranges of the above-mentioned compositions should be regarded as a continuous, discrete set of independent chemical substances. They have a common homologous rule and very similar chemical compositions, crystal structures, and properties. There are 1 figure and 23 references: 5 Soviet-bloc and 18 non-Soviet-bloc. The three references to English-language publications see in the body of the abstract.

Card 5/7

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(B. Belbbooh, C. Piekarski, P. Perio, Ref. 23, Bull. Soc. franc. mineral. et cristallogr., 83, No. 7/9, 206 (1960)), cubic syngony has been confirmed by X-ray studies. A fourfold size of the constant lattice has been found: $a = 4 \cdot 5.433 = 21.73$ Å. This is indicative of the discrete chemical composition of U_4O_9. In the cases of $n = 3$, $n = 4$, $n = 5$, $n = 6$, and $n = 8$, the atomic arrangement has not been defined exactly. It is noted that the increase of n in the above homologous series leads rapidly to very slight differences of the chemical composition between neighboring oxides. Here, the researcher finds innumerable discrete uranium oxides which, with respect to their composition, tend toward UO_2, but never reach it. In this way, the author explains the fact that there never exists an oxide having an ideal composition UO_2, but always somewhat stronger oxidized samples, whose x value is a little higher than 2: $UO_{2.008}$, $UO_{2.010}$. Nevertheless, he supposes that also U_9O_{20}, $U_{10}O_{22} = U_5O_{11}$, $U_{11}O_{24}$ and others will soon be experimentally detected. Due to the insufficient knowledge of the crystal structure, it is still impossible to establish a relationship between the homology of the chemical composition of uranium

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properties of U_3O_8 according to B. Chodura, Ya. Malý (Ref. 14: K resheniyu struktury U_3O_8. II Mezhdunarodn. konfer. OON po primeneniyu atomn. energii v mirnykh tselyakh, A/Conf. 15/P/2099, Czechoslovakia, 20, June 1958, 1958) and S. Siegel (Ref. 15: Acta Crystallogr., 8 No. 10, 617 (1955)). Both modifications of U_3O_8 oxides possibly have a varying composition with oxygen deficiency. n = 4. $U_4O_{10} = U_2O_5$. Since the equilibrium diagram of the U-O system has hitherto not been determined, the exact temperature and concentration limits of stability of U_2O_5 (as in the case of other uranium oxides) are still unknown. n = 5. In the neighborhood of $UO_{2.40}$, U_5O_{12} is tetragonal, which corresponds to the formula U_5O_{12}. n = 6. $U_6O_{14} = U_3O_7$ is tetragonal. n = 7. U_7O_{16}. Its theoretical composition $UO_{2.285} = U_7O_{16}$ really corresponds to the supposed experimental range $UO_{2.28-2.31}$ (P. Perio, Ref. 18: Bull. Soc. chim. France, 1953, 256, 840), which could not be exactly defined by P. Perio. n = 8. $U_8O_{18} = U_4O_9$. In the synthesis of a U_4O_9 monocrystal

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however, are proved to exist as real oxides. They are denoted by corresponding formulas above the ordinates of compositions. In his discussion of known and hypothetical uranium oxides, the author avails himself chiefly of non-Soviet publications. n = 1. UO_4^{2-}, which has never been isolated in the free state, exists as an uranate ion UO_4^{2} and as hydrates, e. g., $UO_4 \cdot 2H_2O$. n = 2. $U_2O_6 = UO_3$. Of these at least 5 polymorphous modifications are known. Recently, the author has confirmed data by W. H. Zachariasen (Ref. 12: Acta Crystallogr., 1, No. 5, 265 (1948)) on the hexagonal structure of the α-UO_3 oxide. L. M. Kuznetsov of the author's laboratory produced this oxide by thermal decomposition of $U(C_2H_4)_2 \cdot 3H_2O$. Furthermore, the author has confirmed the cubic structure of the ReO_3 type for δ-UO_3 by neutron diffraction measurements (discovered by E. Wait, Ref. 13, J. Inorg. and Nucl. Chem., 1, No. 4/5, 309 (1955)). The structure of two additional synthesized UO_3 oxides has hitherto not been determined by the author. n = 3. Ye. S. Makarov mentions the

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15.2230
21.4100

25718

S/020/61/139/003/017/025
B103/B226

AUTHOR: Makarov, Ye. S.

TITLE: The homologous series of uranium oxides U_nO_{2+2}

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 139, no. 3, 1961, 612-615

TEXT: The author notes that the chemistry of the U—O system is very complicated due to the existence of oxides of varying composition as well as of the so-called "non-stoichiometric" oxides (not corresponding to a simple stoichiometric ratio between U and O). Since uranium exhibits a different chemical nature, and, according to its valence, can be similar to lanthanides or the elements IV A, V A, or VI A, the author assumes the existence of a general homologous rule (similar to W, Mo, V, and Ti) governing the composition of individual uranium oxides. According to his opinion, this is confirmed by data available in publications. In Fig. 1, the compositions of uranium oxides having the total formula U_nO_{2n+2} (where n denotes integers) are indicated on the axis of the compositions UO_x by vertical lines. The eight initial homologs of this series,

Card 1/5

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ANIKINA, L.I.; MAKAROV, Ye.S.

The unit cell of umohoite ($UO_2MoO_4 \cdot 4H_2O$). Dokl. AN SSSR 137 no.4:942-943 Ap '61. (MIRA 14:3)

1. Institut khimii i analiticheskoy khimii im. V. I. Vernadskogo AN SSSR. Predstavleno akademikom A. P. Vinogradovym.
(Umohoite)

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KUZNETSOV, I.N.; MAKAROV, Ye.S.; TUROVTSEVA, Z.M.

Application of X-ray structural phase-shift analysis to the determination of gases in metals. Trudy kom.anal.khim. 10:122-128 '60. (MIRA 13:8)

1. Institut geokhimii i analiticheskoy khimii imeni V.I.Vernadskogo AN SSSR, Moskva.
(Gases in metals)
(X-ray crystallography)

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MAKAROV, Ye.N.

Second V.I.Vernadskii lecture. Geokhimiia no.6:557 '60. (MIRA 13:10)

(Silicates)

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MAKAROV, Ye. S.; LIPOVA, I.M.; DOLMANOVA, I.F.; MELIK'YAN, A.A.

Crystalline structure of uraninites and pitchblendes. Geokhimiia no.3:193-213 '60. (MIRA 14:5)

1. V. I. Vernadsky Insitute of Geochemistry and Analytical Chemistry, Academy of Sciences, U. S.S.R. Moscow.
(Uraninite)

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MAKAROV, Ye.S.; KUZNETSOV, L.M.

Crystal structure and chemical properties of lower titanium oxides $TiO_{O \to 0.48}$. Zhur.struk. khim. 1 no.2:170-177 Jl-Ag '60. (MIRA 13:9)

1. Institut geokhimii i analiticheskoy khimii im. V.I.Vernadskogo AN SSSR.

(Titanium oxide)

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PHASE I BOOK EXPLOITATION SOV/4417

Akademiya nauk SSSR. Komissiya po analiticheskoy khimii

Analiz gazov v metallakh (Analysis of Gases in Metals) Moscow, 1963. 376 p. (Series: Its: Trudy, vyp. 15) Errata slip inserted. 4,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut geokhimii i analiticheskoy khimii imeni V.I. Vernadskogo. Komissiya po analiticheskoy khimii.

Resp. Ed.: A.P. Vinogradov, Academician; Ed. of Publishing House: A.L. Bankvitser; Tech. Ed.: V.F. Brudnyl'.

PURPOSE: This book is intended for laboratory personnel concerned with gas analysis in metals.

COVERAGE: This collection of articles is based on materials of the Commission on Analytical Chemistry AS USSR on problems dealing with gas analysis in metals. The articles present data on: 1) The vacuum-fusion method, developed by European scientists and the Soviet scientists N.F. Chizhevskiy and Yu.A. Klyachko, for the analysis of gases in steel and aluminum, and now applicable to analysis of gases in other metals. 2) The research of Z.M. Turovtseva and coworkers at the Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy AS USSR, Moscow, making it possible to evaluate the practicability and fields of application of the different analytical methods. 3) The contributions of Yu.A. Klyachko and coworkers in their study of thermodynamic methods for the evaluation of suitable conditions for carrying out analysis. 4) The determination of gases in metals by the sulfurous method as developed by A.K. Babko. 5) The spectrum isotope method for the determination of hydrogen as developed by A.R. Zaydel' and coworkers. The authors of these articles systematize and review critically the various analytical methods, describe the apparatus used in analysis, and indicate the basic trends of research. References accompany most of the articles.

Gel'd, P.V., and R.A. Ryabov [Ural'skiy politekhnicheskiy institut imeni S.M. Kirova - Ural Polytechnic Institute imeni S.M. Kirov, Sverdlovsk]. Effect of Alloying Elements on the Hydrogen Diffusion Rate in Steel at High Temperatures 27

Ryabov, R.A., and P.V. Gel'd [Ural Polytechnic Institute imeni S.M. Kirov, Sverdlovsk]. Effect of Phase Conversions on the Hydrogen Diffusion Rate in Steel 37

Fedorov, S.F., L.D. Kunin, and I.N. Zaytsev [Central Scientific Research Institute of Ferrous Metallurgy, Moscow]. Effect of the Structural Factor on Hydrogen Diffusion in the Fe - Si - Mn Alloy 46

Kunin, L.D., S.F. Fedorov, and I.N. Zaytsev [Central Scientific Research Institute of Ferrous Metallurgy, Moscow]. Study of the Interaction of Gases with Metals 49

Piatuli, V.I. Mass Spectrum Method of Determining the Concentration and Diffusion Coefficients of Gases in Metals 71

II. METHODS OF GAS ANALYSIS IN METALS

Turovtseva, Z.M. [Institut geokhimii i analiticheskoy khimii imeni V.I. Vernadskogo AN SSSR - Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy AS USSR, Moscow]. Evaluation of the Possibility of Determining Gases in Metals by the Groups of the Periodic System of Elements 82

Malikova, Ye.D., and Z.M. Turovtseva [Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy AN USSR, Moscow]. Determination of Oxygen in Alkali Metals and in Their Alloys by the Mercury Extraction Method 91

Litvinova, N.F., V.I. Malyshev, and Z.M. Turovtseva. Determination of Oxygen in Sodium and in the Na-K Alloy 97

Malikova, Ye.D., and Z.M. Turovtseva [Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy AS USSR, Moscow]. Determination of Oxygen in Alkaline Earth Metals by the Distillation Method 103

Turovtseva, Z.M., N.F. Litvinova, N.M. Vasil'yeva, and K.G. Semenyuk [Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy AS USSR, Moscow]. The Vacuum-Fusion Method With the Use of a Platinum Bath for the Determination of Gases in Metals 109

Kharlamov, V.I. Methods of Preparing Analytical Samples of Alkali Metals for Vacuum Extraction 117

Kuznetsov, L.M., Ye.S. Makarov, and Z.M. Turovtseva [Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy AS USSR, Moscow]. Use of X-Ray Diffraction Phase Analysis for the Determination of Gases in Metals 122

MAKAROV, YE.S.

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Quantitative Determination of Oxygen in the Lowest Titanium Oxides by Radiographic Analysis

SOV/75-14-4-14/30

that all lines of the samples with the composition $TiO_{0-0.5}$ correspond to the hexagonal, tightly packed structure of α-titanium. Beginning with the oxide $TiO_{0.5}$, a system of weak lines occurs in the radiographs which indicate a phase with variable composition on the basis of TiO. The boundary for the uniformity of solid solutions of oxygen in α-titanium lies therefore approximately at the composition $TiO_{0.48}$. A figure shows the dependence between the lattice constants c and the corresponding contents of oxygen in the lowest titanium oxides. The accuracy of the radiographic method used was ±0.1 wt%. There are 1 figure, 1 table, and 5 references, 2 of which are Soviet.

ASSOCIATION: Institut geokhimii i analiticheskoy khimii im. V. I. Vernadskogo AN SSSR, Moskva (Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, AS USSR, Moscow)

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Card 3/3

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approximately 8000 kg/cm^2, and kept for 15 hours in a quartz tube at 1000±20° in order to obtain a uniform distribution of oxygen in the preparations. The annealed samples ($TiO_{0.05}$ and $TiO_{0.3}$) showed a reduction in weight of from 4.10^{-4} - 7.10^{-4}g, which was probably caused by sublimation. The obtained preparations were light-grey at the points of rupture, and became dark on being ground fine. The composition of the preparations was determined by the method of the vacuum melt (Ref 3). The radiographic determination of the lattice constant was carried out by the method of Debye-Scherrer. In order to obtain most accurate values for the lattice constants, the asymmetric method according to Straumanis and Jevins (Ref 4) was used. One of the most important conditions for the maximum accuracy of this method is the use of powdered samples (thickness $<$ 0.2 mm). The dimensions and conditions for the taking of X-ray spectra are indicated in the paper. The composition of the preparations under discussion, and the values of the corresponding lattice constants are shown in a table. The evaluation of the radiographs showed

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SOV/75-14-4-14/30

5(2)
AUTHORS: Kuznetsov, L. M., Makarov, Ye. S., Turovtseva, Z. M.

TITLE: Quantitative Determination of Oxygen in the Lowest Titanium Oxides by Radiographic Analysis

PERIODICAL: Zhurnal analiticheskoy khimii, 1959, Vol 14, Nr 4, pp 463 - 465 (USSR)

ABSTRACT: As the lowest titanium oxides the authors understand the solid solutions of oxygen in α-titanium with the composition TiO_{0} to 0.42. Radiographic analyses of these compounds (Refs 1,2) show a steep course of the curves for the dependence of the lattice constant c on the oxygen content in α-titanium which crystallizes hexagonally. Based on this result, the radiographic method can be used for the quantitative determination of oxygen dissolved in α-titanium. In the paper under review, an experiment is made in this direction. The authors synthetized the lowest titanium oxides by saturating finely pulverized titanium with the calculated amount of gaseous oxygen at 500-550°. The powdery oxide preparations obtained were formed into small cylindrical columns at a pressure of

Card 1/3

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SOV/70-4-2-6/36

The Crystal Structure of the Compounds of Uranium with Germanium

Laue and oscillation photographs of single crystals of U_3Ge_4 showed the material to be orthorhombic with $a = 5.86$, $b = 9.86$, $c = 8.96$ kX. UGe_2 was similarly shown to be orthorhombic with $a = 4.11$, $b = 15.1$, $c = 3.97$ kX. $Z = 12$ and the dimensions of the unit cell are similar to those of $ZrSi_2$ and $ZrGe_2$. Comparisons of observed S.F.s and those calculated using $ZrSi_2$ coordinates gave a reliability factor of 0.25. The $ZrSi_2$ structure with space group $D_{2h}^{17} = Cmcm$ is therefore likely. It was confirmed that UGe_3 has the $AuCu_3$ structure with $a = 4.197$ kX. There are 3 figures, 2 tables and 2 references, 1 of which is Soviet and 1 English.

SUBMITTED: October 30, 1958

Card 2/2

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

SOV/70-4-2-6/36

AUTHORS: Makarov, Ye.S. and Vykov, V.N.

TITLE: The Crystal Structure of the Compounds of Uranium with Germanium (Kristallicheskaya struktura soyedineniy urana s germaniyem)

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 2, pp 183-185 (USSR)

ABSTRACT: Laue, oscillation and powder photographs showed that U_5Ge_3 is hexagonal with $a = 8.56$ and $c = 5.78$ kX. $d_{obs} = 13.4$ g/cm^3 gives 16.8 atoms per cell representing $Z = 2$. By analogy the compound was assumed to have a structure of the Mn_5Si_3 (Mn_5Ge_3) type. An electron density projection onto 0001 was calculated. This showed that the structure is actually of the Mn_5Si_3 type. The space group is $D^3_{6h} = C6/mcm$ with $4U_I$ in 4(d) positions; $6U_{II}$ in 6(g) positions with $x_U = 0.24$ and $6Ge$ in 6(g) positions with $x_{Ge} = 0.62$. Good agreement between observed and calculated structure factors is obtained.

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On the Duality of the Chemical Nature of Actinides 78-3-5-4/39

actinides, lanthanides and the elements of the group IVa, Va, VIa is continued. An isostructural analogy is also to be found in the intermetallic compounds.
The actinide elements with the elements of the IVa, Va, VIa groups enter continuous solid solutions with cubic centred lattice. A similar isomorphism does not exist in the systems of the actinides and lanthanides. The numerous isomorphisms between the compounds of the actinides and the IVa, Va and VIa groups on one hand and the similarity of the actinides to the lanthanides indicate that the actinides can not be denominated as transuranian elements, as their chemical nature shows duality.
There are 1 figure, 7 tables, and 14 references, none of which are Soviet.

ASSOCIATION: Institut geokhimii i analiticheskoy khimii imeni V. I. Vernadskogo Akademii nauk SSSR (Institute of Geochemistry and Analytic Chemistry imeni V. I. Vernadskiy, AS USSR)
SUBMITTED: June 15, 1957
AVAILABLE: Library of Congress

Card 2/2 1. Actinides--Structural analysis

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

MAKAROV, Ye. S.

AUTHOR: Makarov, Ye. S. 78-3-5-4/39

TITLE: On the Duality of the Chemical Nature of Actinides (O dvoystvennosti khimicheskoy prirody aktinidov)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol 3, Nr 5, pp 1079-1088 (USSR)

ABSTRACT: This paper deals with the extensive experimental material on the crystallo-chemical analogy between the compounds of the actinides on the one hand and the compounds of the elements of the Va, VIa, IVa groups and the rare earths on the other.

It was determined that a profound crystallo-chemical similarity exists between these groups. The oxides of ThO_2, UO_2, CrO_2, and CeO_2 not only have similar chemical properties, but also the structure of these compounds is similar to that of the oxides of the actinides. Furthermore the oxides have chemical properties similar to those of the oxides of the elements of the IVa, Va, VIa groups. In the groups of the nitrides, carbides, and borides, the isostructural analogy between the compounds of the

Card 1/2

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SOV/70-3-1-2/26

New Data on the Structure of $BiIn_2$ and the Possible Structure of $TlBi_{1.27 \rightarrow 1.59}$, $NaHg_2$, UHg_2, UZr_2 and TiU_2

type $BiIn_2$-Ni_2In rather than AlB_2 with an anomalously low value of c/a , as was thought to be the case up to the present time. This suggestion was not verified experimentally by the present author. L.S. Gudkov and L.I. Anikina are thanked for help in experiments and calculations.
There are 1 table and 11 references, 5 of which are Soviet, 2 German and 4 English.

ASSOCIATION: Institut geokhimii im. V.I. Vernadskogo
(Institute of Geochemistry im. V.I. Vernadskiy)

SUBMITTED: June 18, 1957

Card 4/4

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

New Data on the Structure of $BiIn_2$ and the Possible Structure of $TlBi_{1.27 \rightarrow 1.59}$, $NaHg_2$, UHg_2, UZr_2 and TiU_2

compounds of type Ni_2In consists of the following: The lower limit of the axial ratio for the structural type Ni_2In is $c/a = \sqrt{3}/\sqrt{2} = 1.225$ (Ref 10). In fact, among all the experimentally established members of the structural type Ni_2In, among which one component should be a metal belonging to transition groups "A" and the second an element of subgroups "B", there are none which have an axial ratio < 1.225. On the other hand, in the case of $BiIn_2$, this ratio is equal to 1.197 which is less than 1.225. In addition, the compound $BiIn_2$ does not include a transition metal and consists of two elements of sub-groups "B". Low values for the axial ratios for: TiU_2 (0.59), UZr_2 (0.61) (Ref 11), UHg_2 (0.64) and $NaHg_2$(0.64) suggest that probably these compounds have a structure of

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New Data on the Structure of $BiIn_2$ and the Possible Structure of $TlBi_{1.27 \rightarrow 1.59}$, $NaHg_2$, UHg_2, UZr_2 and TiU_2

not take into account some very weak lines which were at first ascribed to some unknown impurity. However, the presence of such impurities was not established and doubts were felt about the correctness of the $BiIn_2$ structure given in an early paper (Ref 1). In order to put this structure on a firmer basis, it was decided to study a monocrystal of this compound and the results of this work are now reported. X-ray studies of this $BiIn_2$ monocrystal have shown that this compound has a structure of type Ni_2In with an axial ratio $c/a = 1.197$. It is suggested that: $TlBi_{1.27 \rightarrow 1.59}$, $NaHg_2$, UHg_2, UZr_2 and TiU_2 have an an analogous structure. Monocrystal studies have shown that $BiIn_2$ has the following lattice constants: $a = 5.496 \pm 0.001$ Å; $c = 6.579 \pm 0.001$ Å ; $c/a = 1.197$. The main crystallographic difference between $BiIn_2$ and

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

SOV/70-3-1-2/26

AUTHOR: Makarov, Ye.S.

TITLE: New Data on the Structure of $BiIn_2$ and the Possible Structure of $TlBi_{1.27\rightarrow 1.59}$, $NaHg_2$, UHg_2, UZr_2 and TiU_2 (Novyye dannyye o strukture $BiIn_2$ i vozmozhnaya struktura $TlBi_{1.27\rightarrow 1.59}$, $NaHg_2$, UHg_2, UZr_2 i TiU_2)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 1, pp 5-9 (USSR)

ABSTRACT: Among intermetallic compounds which have a hexagonal structure of the type AlB_2 there are a few cases with anomalously low ratio of axes c/a which is equal to about 0.6. On the other hand, in "normal" borides and halides of this type this ratio is roughly 1.0. Such "anomalous" intermetallic compounds are:

$BiIn_2$ (Ref 1), $TlBi_{1.27\rightarrow 1.59}$ (Refs 2, 3), TiU_2 (Ref 4)

UHg_2 (Ref 5), $NaHg_2$ (Ref 6) and UZr_2.

The crystal structure determination of all these compounds was carried out by the powder method. In earlier studies of the crystal structure of $BiIn_2$ (Ref 7), the author did

Card1/4

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data (up to 1957) on the crystal chemistry of simple compounds of actinide elements. The dual nature of actinides is discussed in order to show the similarity and difference of their chemical behavior with respect to other elements and to clarify their position in the periodic table. There are 117 references of which 13 are Soviet, 90 English, 9 German, 2 French, and 3 Italian.

TABLE OF CONTENTS:

From the Editor 3

I. Introduction 5

II. Some Problems of General Crystal Chemistry 6
Classes of crystalline structures 7
Types of bonds and their characteristics 8
Molecular concepts in crystal chemistry 14

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

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PHASE I BOOK EXPLOITATION 1068

Makarov, Yevgeniy Sergeyevich

Kristallokhimiya prosteyshikh soyedineniy urana, toriya, plutoniya i neptuniya (Crystal Chemistry of Simple Compounds of Uranium, Thorium, Plutonium, and Neptunium) Moscow, Izd-vo AN SSSR, 1958. 141 p. 6,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut geokhimii i analiticheskoy khimii.

Resp. Ed.: Vinogradov, A.P. Academician; Ed. of Publishing House: Trifonov, D.N.; Tech. Ed.: Makuni, Ye.V.

PURPOSE: The book is intended for scientists and engineers working in the field of atomic energy.

COVERAGE: The book represents the first attempt to organize published

Card 1/8

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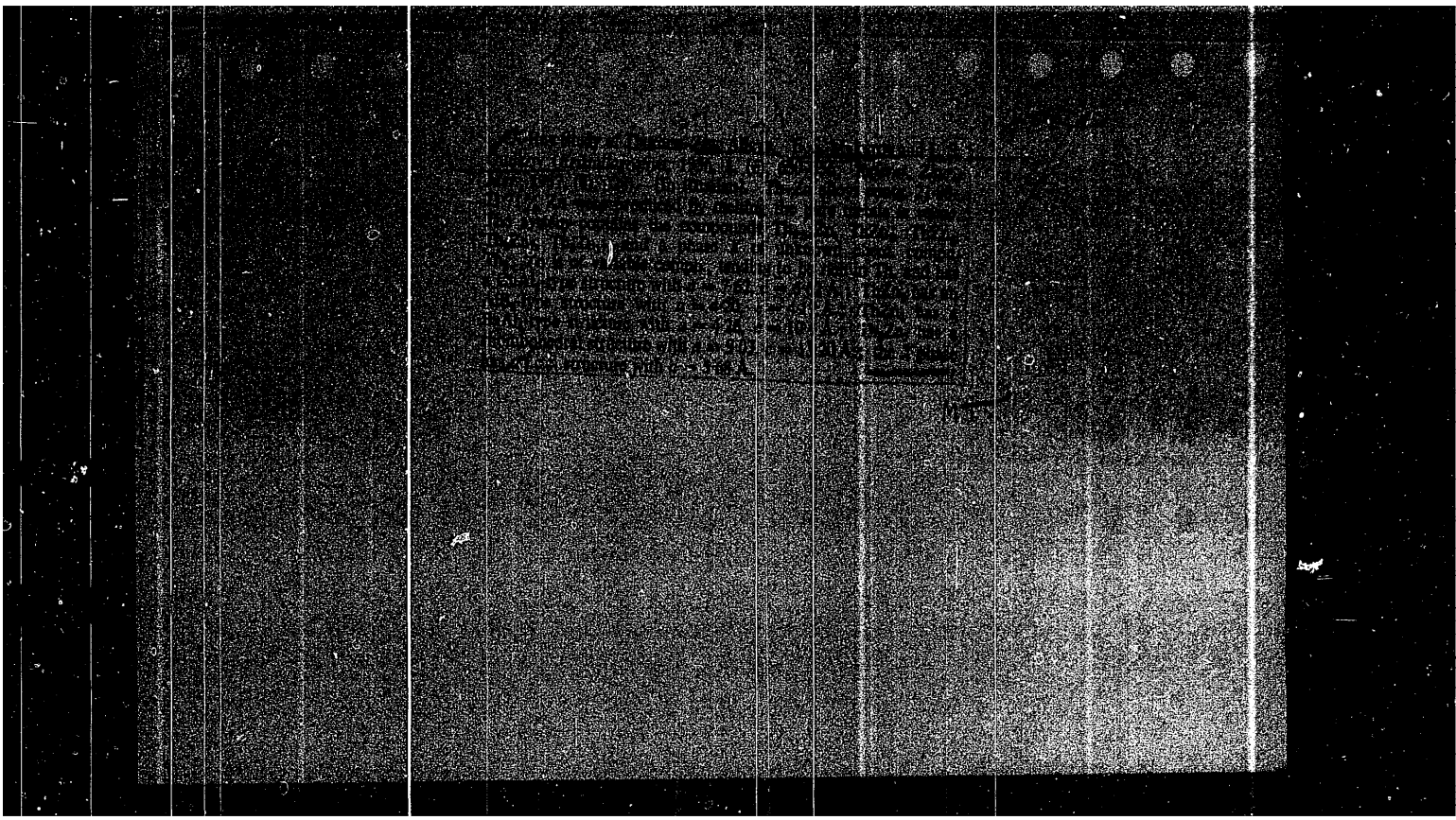

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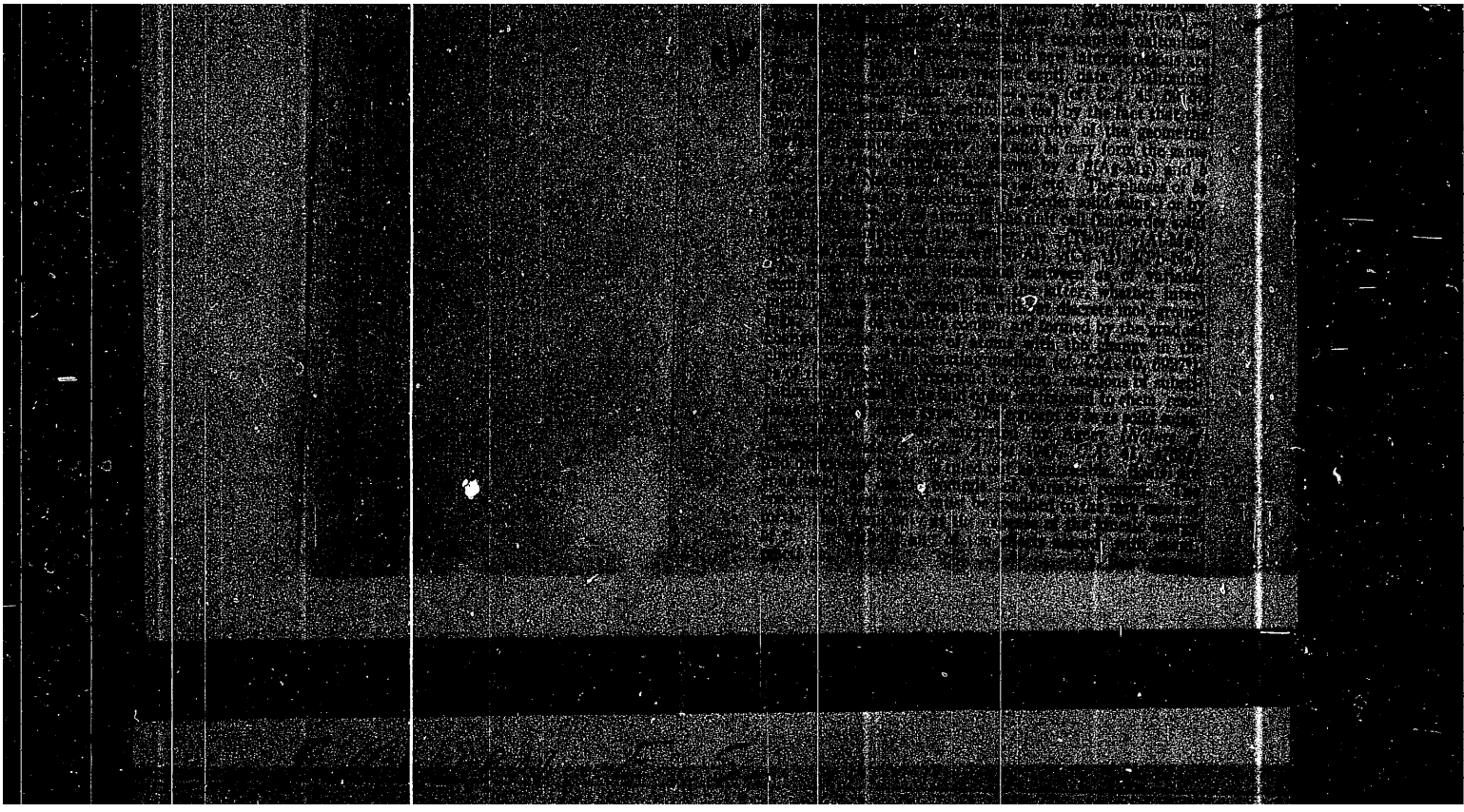

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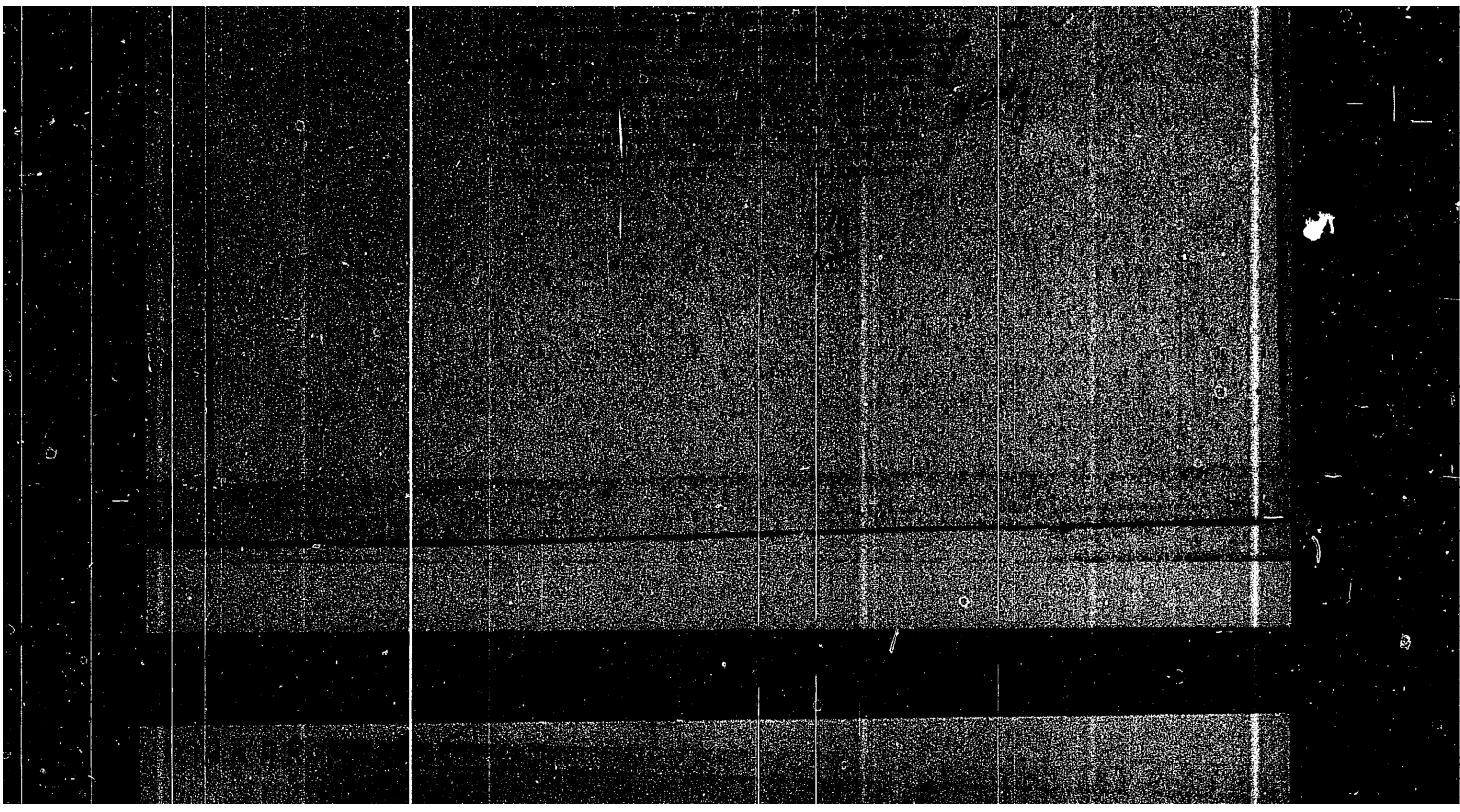

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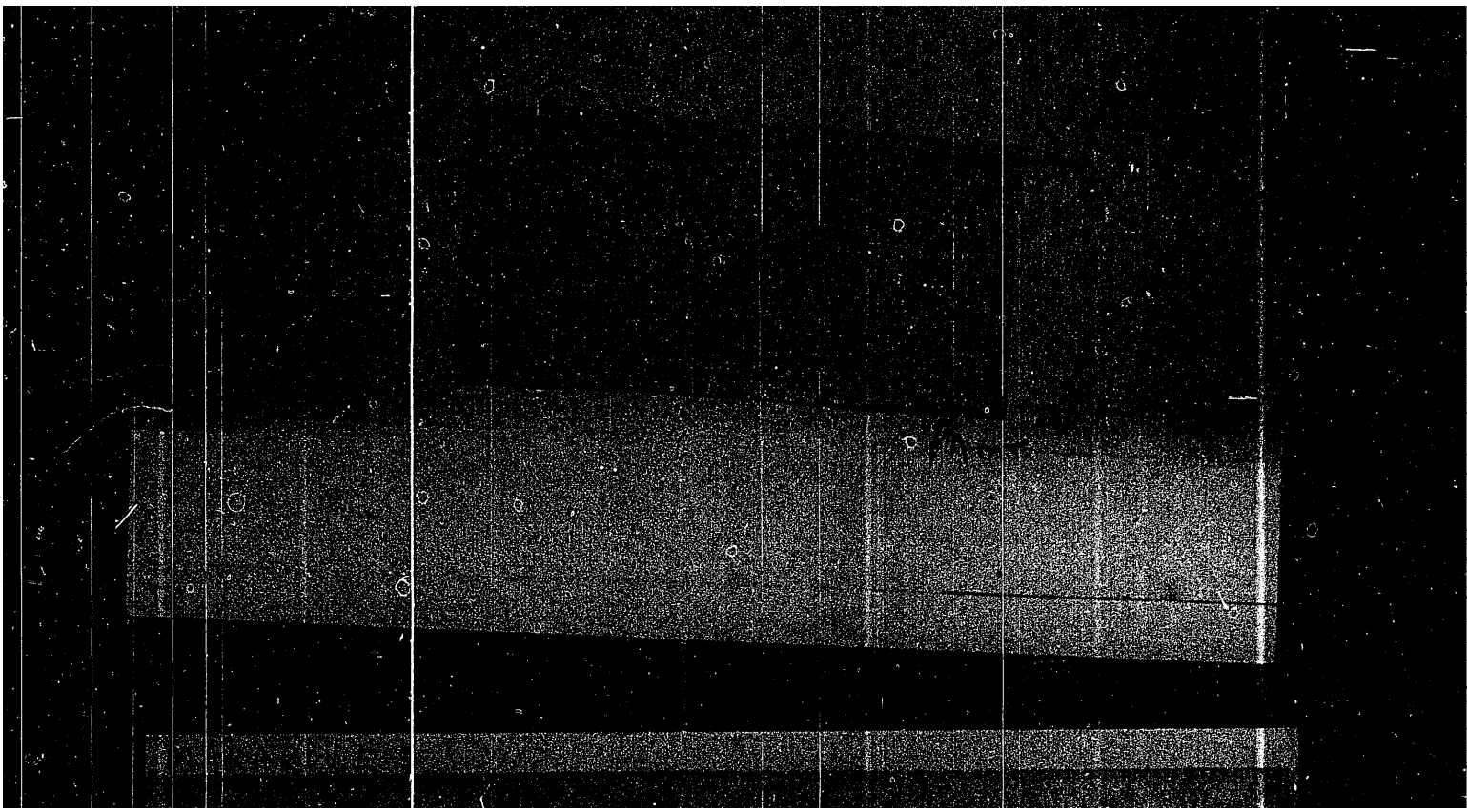

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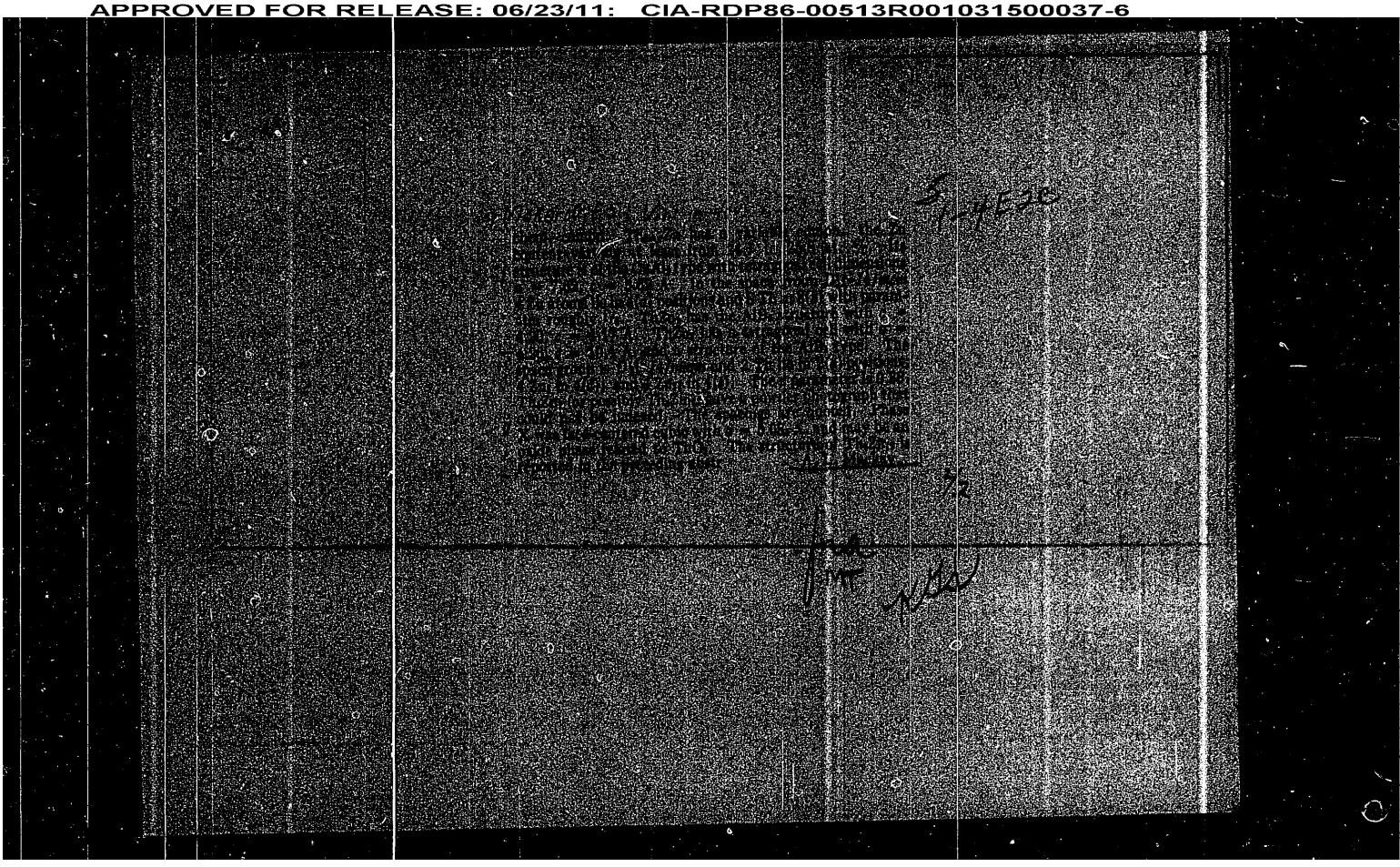

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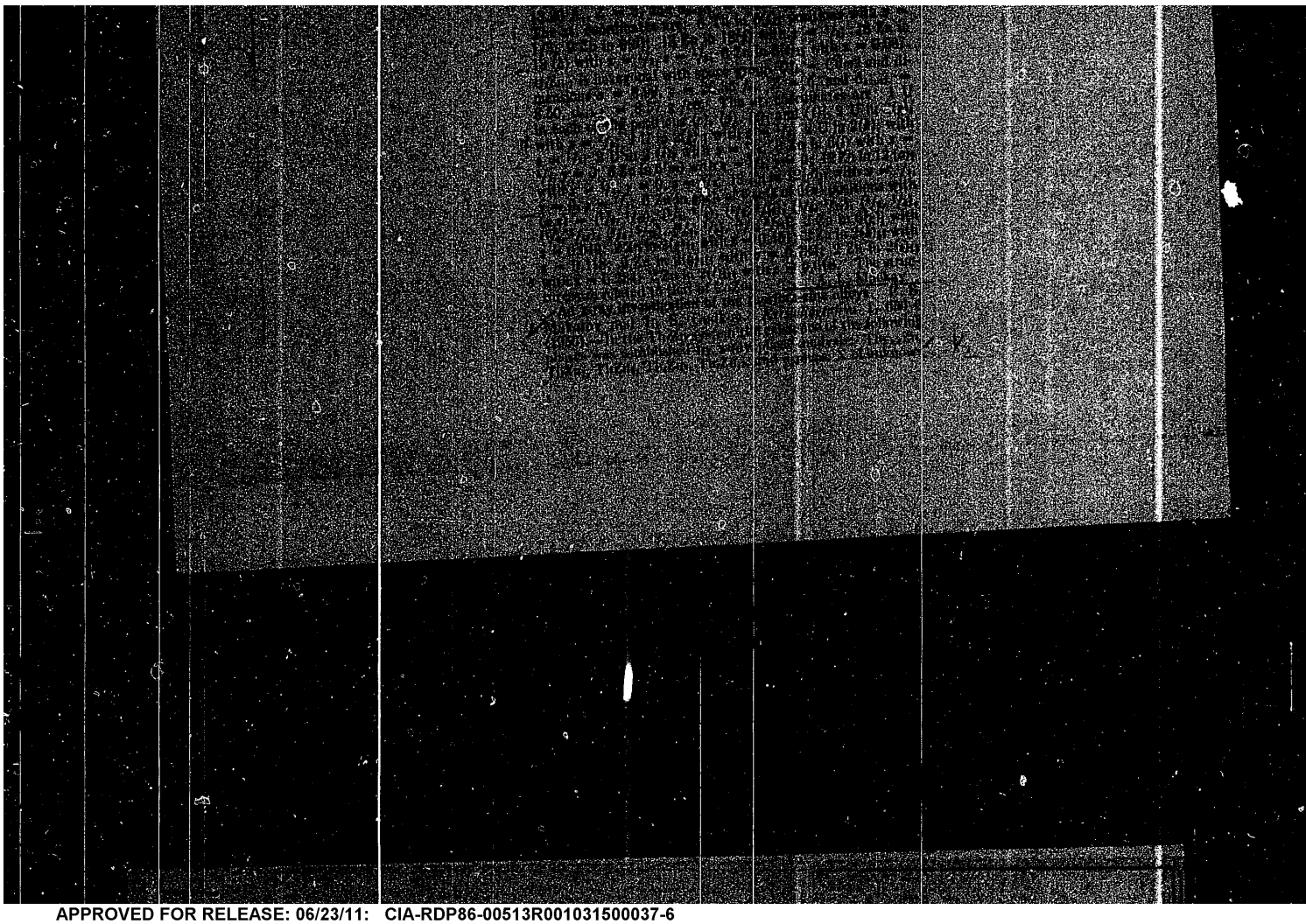

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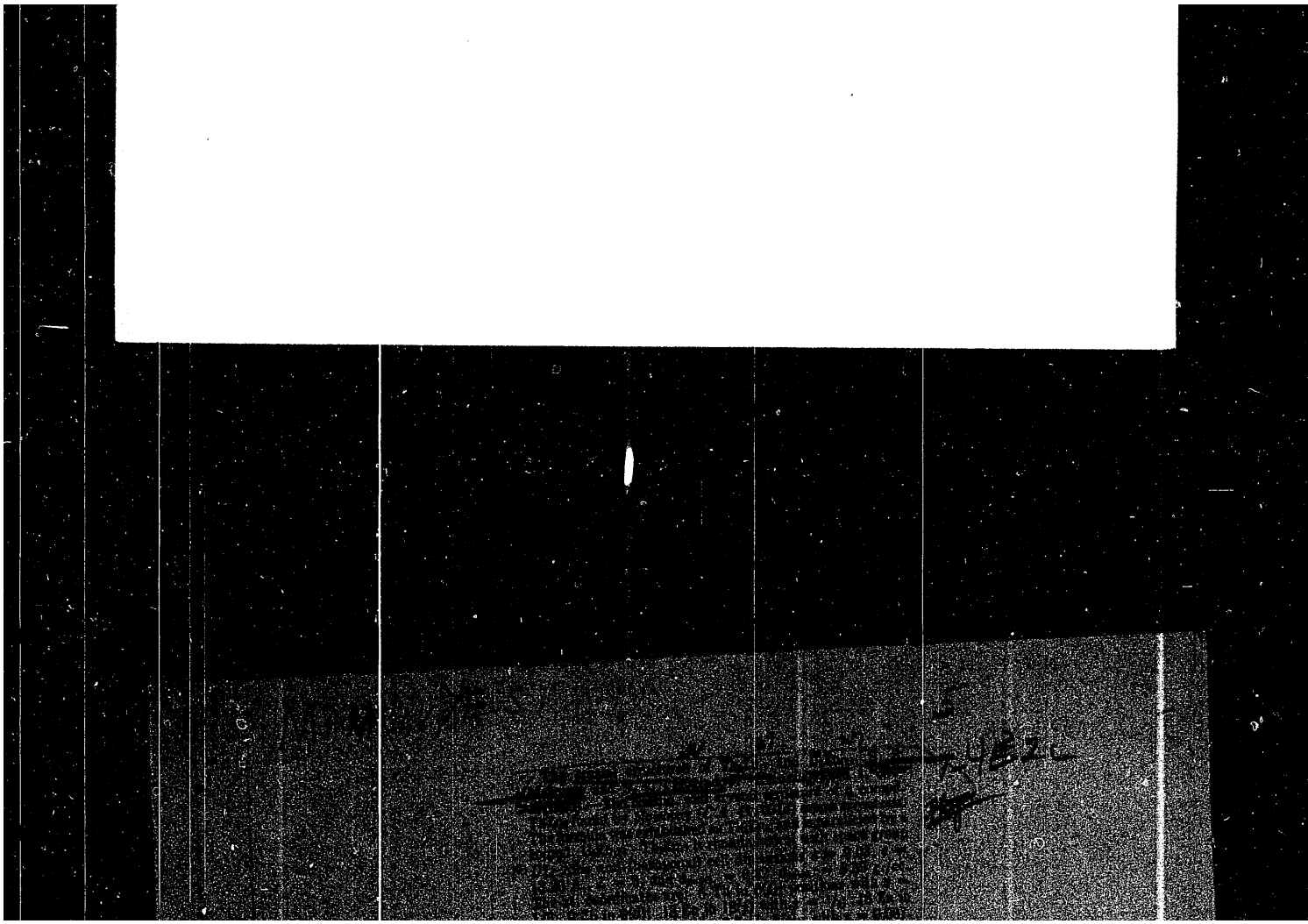

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MAKAROV, E. S.

(2) 5

*Structure of Alloys of Nickel with Aluminium in the β-Phase Region at High Temperatures. L. A. Guseva and E. S. Makarov (*Doklady Akad. Nauk S.S.S.R.*, 1951, 77, (4), 615–618).—[In Russian]. Alloys contg. 60·06 at.-% Ni quenched from 1340° C. are single-phase and have a tetragonal structure. X-ray analysis of these alloys in the annealed state shows the presence of two phases, β + α′ (Ni_3Al), in agreement with the equilibrium diagram of Bradley and Taylor (*Proc. Roy. Soc.*, 1937, [A], 159, 56; *M.A.*, 4, 241). The quenched alloys have a partially ordered body-centred structure. For the alloy with 60·6 at.-% Ni (Ni_3Al_2), a = 2·663, c = 3·237 kX, c/a = 1·125; d = 6·66; number of atoms in unit cell = 1·96. For the alloy with 66·6 at.-% Ni (Ni_2Al), number of atoms in unit cell = 2·01. The observed intensities of the reflections in an X-ray photograph of an alloy contg. 60·6 at.-% Ni, quenched from 1340° C., agree satisfactorily with the values calculated for Ni_3Al_2.

—G. V. E. T.

Evaluation B-78524

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CA

New data on the crystal structure of the β-phase of the system sodium-lead. E. S. Makarov and Z. V. Popova. *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk* 1951, 377-87.—An exptl. study was made to det. the compn. range of the β-phase and the corresponding crystal structures. To prevent excessive reaction of the alloys with O_2 or moisture, data were obtained within 5 hrs. after prepn. of the alloys. The Pb was melted in an Fe crucible under a const. flow of A gas by use of an elec. furnace. Freshly cut Na was added when the temp. of the Pb was slightly above the liquidus and was stirred in. No flashing occurred. After a min. a sample for chem. analysis was pumped into a 1.5-mm. diam. glass tube, and a sample for x-ray analysis was pumped into a 0.4 to 0.8 mm. capillary of Li deman glass. Both ends of the capillary were sealed to reduce the empty space. Homogenization was not needed. Debye x-ray patterns were obtained with a 57.3-mm.-diam. camera, Cu radiation, 35 kv., and 10 ma. Lattice consts. were accurate to ± 0.002 kX. Powder specimens gave poorer results than did the cast specimens. Chem. analysis was done by amalgamating the Pb, dissolving the Na in H_2O, and titrating the latter with 0.1 *N* HCl, with methyl orange. Duplicates agreed to 0.1%. Density measurements with a precision of ± 1% were made with a pycnometer and Na-dried aviation gasoline. At room temp. the β-phase existed from 26.5 to 35.1 at. % Na. The lattice const. decreased with increasing Na content from 4.870 to 4.861 kX, and the d. decreased from 8.79 to 7.49, with an especially rapid fall near 35% Na. The no. of atoms per unit cell in the ordered Cu_3Au-type structure was calcd. as 3.95 up to about 33% Na, but at 35% Na it was only 3.65. No significant change in the degree of order with increasing Na content was detected by measuring the relative values of a "structure" and of a "superstructure" x-ray line. A calcn. showed that the ratio of these values would change only by 2% in going from 27.0 to 33.0% Na. A. G. Guy

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CA 2

Nomenclature and symbols for solid phases of variable composition. E. S. Makarov. *Doklady Akad. Nauk S.S.S.R.* 74, 1093–6(1950).—Compds. of fixed and simple stoichiometric compn. will be represented conventionally: AB, AB_2, A_2B_3, etc. Compds. of fixed but nonstoichiometric compn. will be represented by AB_x, in which $x = n/(100-n)$; n = at. % of B. E.g., for the system Cu–Be contg. 70.0 at. % Be the formula is $CuBe_{2.33}$. Solid solns., the content of one of whose components may vary from 0 to a definite limit at a given temp. and atm. pressure, will be represented by ρ-$AB_{0\rightarrow x}$(t° C.), in which x is defined as above. Those solns. that exist in the form of several modifications will be distinguished by Greek letters: e.g., $\beta\rightarrow\gamma$-$FeC_{0\rightarrow 0.03}$(1140°). Solid solns. of unlimited variability in compn. will be represented by ρ_m - (A,B). Intermediate phases of variable compn. will be represented by $AB_{x_1\rightarrow x_2}$ (t° C.); for berthollides and daltonides this type formula is preceded by *b* or *d*; e.g., *b*-$TiO_{0.95\rightarrow 1.05}$. The views of other workers are discussed. J. P. Danehy

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9

cA

Crystal structure of the γ-phase in the aluminum-magnesium system and the γ-phase in the thallium-bismuth system. E. S. Makarov. *Doklady Akad. Nauk S.S.S.R.* 74, 935-8(1950).—An exptl. study at 20° of these intermediate solid solns. confirmed previous data on cryst. structure. The γ-phase in Al-Mg has the α-Mn structure with a lattice const. that varies linearly with at. % Al between the soly. limits, $a = 10.5700 \pm 0.0003$ *kX* at 38.5 at. % Al and $a = 10.4480$ at 48.4 at. % Al. The γ-phase in Tl-Bi appeared to be essentially a disordered structure of the AlB_2 type; it had a hexagonal structure and had soly. limits of 56.0 and 61.4 at. % Bi. At 56, 58, and 60 at. % Bi the a and c values were 5.642, 5.644, 5.652 and 3.372, 3.375, 3.371. Density measurements showed that in both cases the phases are substitutional. The alloys were carefully prepd. to prevent loss by evapn. and the analyses were assumed to be those of the syntheses. Homogenization for 3 days at 450° and 7 days at 140°, resp., was followed by slow cooling.

Filtered Cu x-radiation was used in a camera [illegible] mm in diam. A. G. Guy

Sept 10 ?

1951

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

Continuous transition between the tetragonal and the cubic forms of alloys of indium and thallium. E. S. Makarov (N. S. Kurnakov Inst. Gen. and Inorg. Chem., Acad. Sci. U.S.S.R., Moscow). *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk* 1950, 485–91.—X-ray diffraction detns. on In-Tl alloys with up to 30.0 at. % Tl show that a tetragonal and a cubic form exist in the one-phase range of the alloys at room temp., not sepd. by a two-phase region. The tetragonal form lies in the range from 0 to 25.0 at. % Tl; the cubic form, from 25.0 up to Tl-rich limit of the compn. investigated. There is a continuous crystallographic transition between the 2 forms, with the lattice const. *a* increasing regularly with the Tl content, and the const. *c* and the ratio *c/a* decreasing up to the compn. 22.5 at. % Tl. The lattice consts. vary sharply but still continuously between 22.5 and 23.0 at. % Tl; with further increasing Tl content, from 23.0 to 25.0 at. %, the lattice consts. again vary smoothly. The curves of *a* and *c* merge at 25.0 at. % Tl, and the ratio *c/a* becomes = 1, i.e. the tetragonal form has gone over into the cubic form. In both the tetragonal and the cubic range the alloys are substitutional, with an unchanged no. of atoms in the elementary cell = 4, and the coördinates 0, 0, 0; $^1/_2$, 0, $^1/_2$; $^1/_2$, $^1/_2$, 0; 0, $^1/_2$, $^1/_2$, corresponding to the original face-centered structure of In, with random distribution of the In and Tl atoms in the lattice. N. Thon

1951

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MIRGALOVSKAYA, M.S.; MAKAROV, Ye.S.

Crystalline structure and properties of S phase in the Al - Cu - Mg system. Izv. Sekt. fiz. khim. anal. 18:117-127 '49. (MIRA 11:4)

1. Institut obshchey i neorganicheskoy khimii im. N.S. Kurnakova AN SSSR.

(Aluminum) (Copper) (Magnesium)

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PA149T15

USSR/Chemistry - Crystal Structure 21 Sep 49
Bismuth Compounds

"Crystal Structure of In_2Bi," Ye. S. Makarov, Inst of Gen and Inorg Chem imeni N. S. Kurnakov, Acad Sci USSR, 2 pp

"Dok Ak Nauk SSSR" Vol LXVIII, No 3, 409-10

Described first of two chemical compounds in indium-bismuth system, InBi, in previous article ("Dok Ak Nauk SSSR," Vol LIX, No 5, 1948). Describes crystal structure of In_2Bi herein. Table gives Miller indexes and compares experimental and theoretical values for $\sin^2\Phi$ and

149T15

USSR/Chemistry - Crystal Structure (Contd) 21 Sep 49

intensities of "regulated variants." Submitted by Acad G. G. Urazov 18 Jul 49.

149T15

MAKAROV, YE. S.

[redacted]

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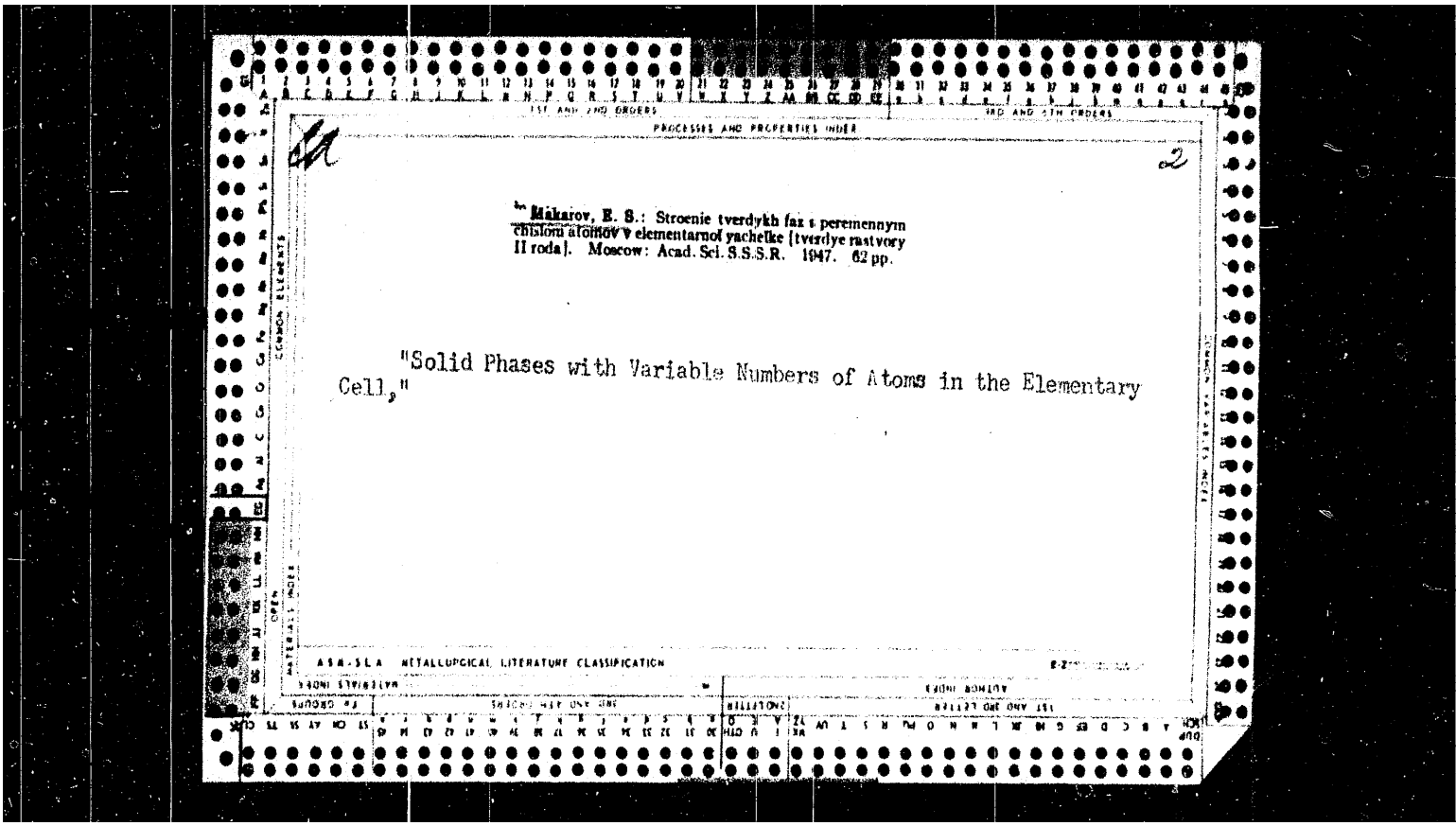

1ST AND 2ND ORDERS 3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

2

Makarov, E. S.: Stroenie tverdykh faz s peremennym chislom atomov v elementarnoĭ yacheĭke [tverdye rastvory II roda]. Moscow: Acad. Sci. S.S.S.R. 1947. 62 pp.

"Solid Phases with Variable Numbers of Atoms in the Elementary Cell,"

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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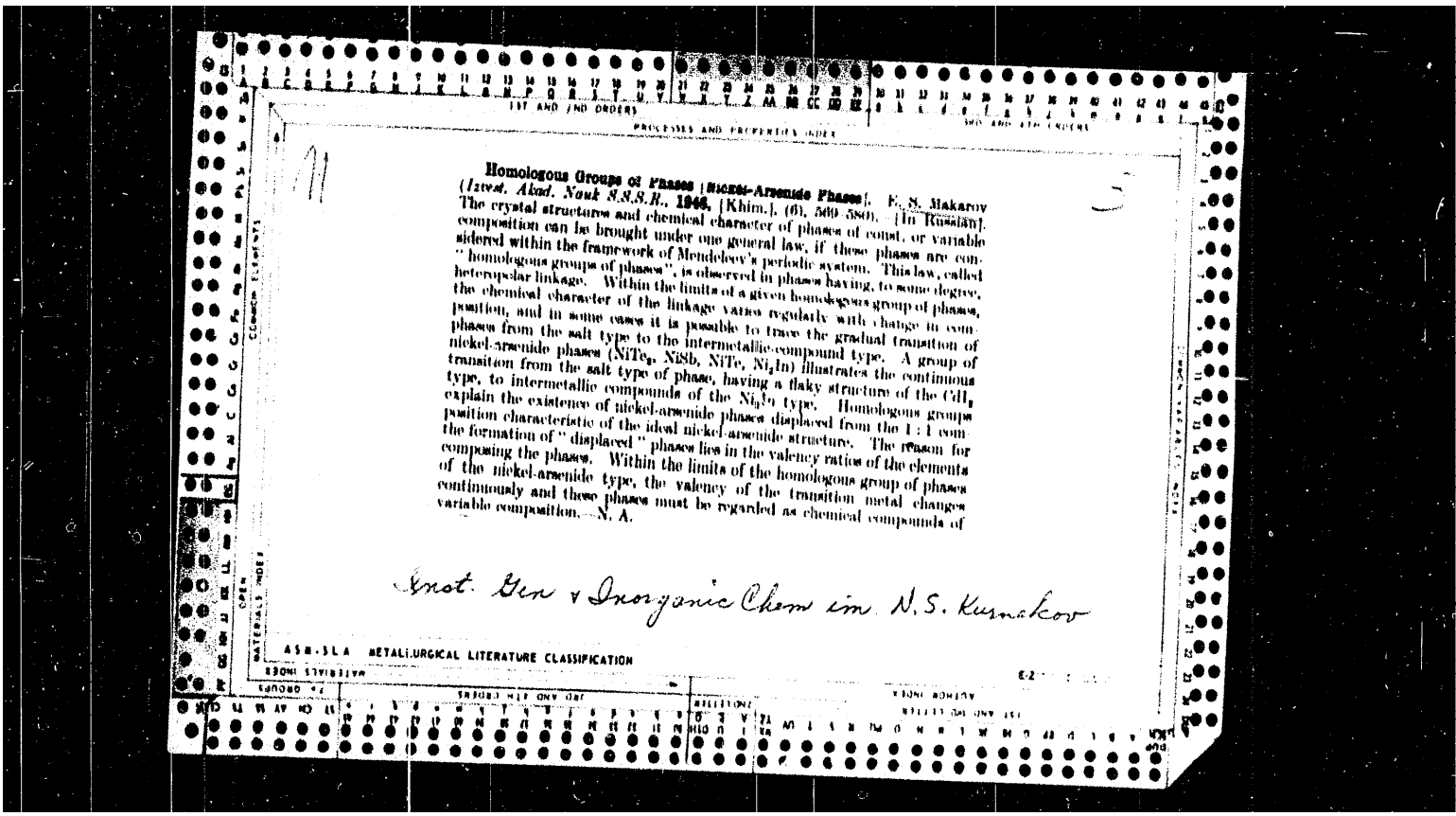

Homologous Groups of Phases [Nickel-Arsenide Phases]. E. S. Makarov (*Izvest. Akad. Nauk S.S.S.R.*, **1946**, [Khim.], (6), 569–580). [In Russian].
The crystal structures and chemical character of phases of const. or variable composition can be brought under one general law, if these phases are considered within the framework of Mendeleev's periodic system. This law, called "homologous groups of phases", is observed in phases having, to some degree, heteropolar linkage. Within the limits of a given homologous group of phases, the chemical character of the linkage varies regularly with change in composition, and in some cases it is possible to trace the gradual transition of phases from the salt type to the intermetallic-compound type. A group of nickel-arsenide phases ($NiTe_2$, NiSb, NiTe, Ni_2In) illustrates the continuous transition from the salt type of phase, having a flaky structure of the CdI_2 type, to intermetallic compounds of the Ni_3Sn type. Homologous groups explain the existence of nickel-arsenide phases displaced from the 1 : 1 composition characteristic of the ideal nickel-arsenide structure. The reason for the formation of "displaced" phases lies in the valency ratio of the elements composing the phases. Within the limits of the homologous group of phases of the nickel-arsenide type, the valency of the transition metal changes continuously and these phases must be regarded as chemical compounds of variable composition.—N. A.

Inst. Gen & Inorganic Chem im. N.S. Kurnakov

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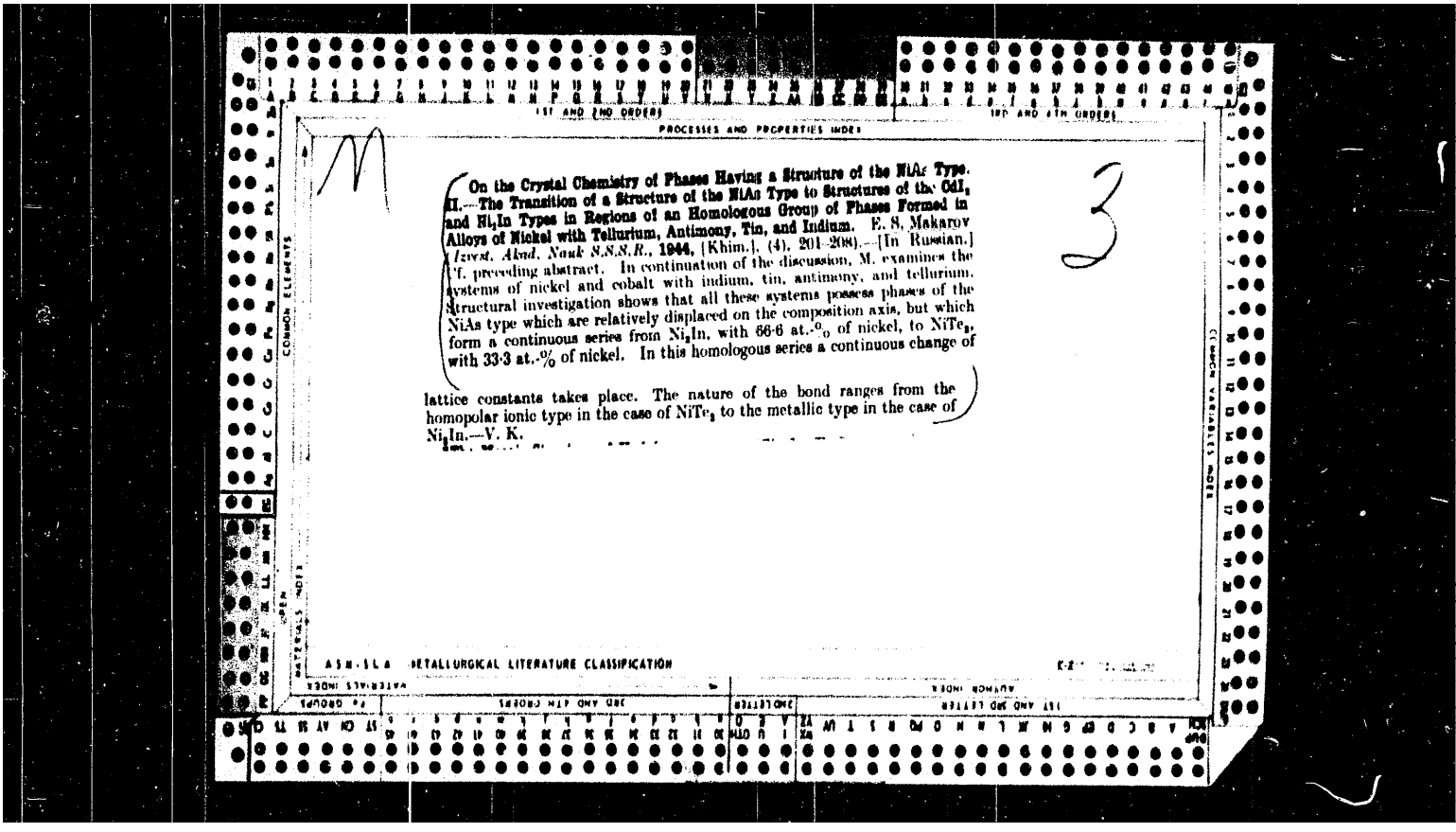

PROCESSES AND PROPERTIES INDEX

On the Crystal Chemistry of Phases Having a Structure of the NiAs Type. II.—The Transition of a Structure of the NiAs Type to Structures of the CdI_2 and Ni_2In Types in Regions of an Homologous Group of Phases Formed in Alloys of Nickel with Tellurium, Antimony, Tin, and Indium. E. S. Makarov *Izvest. Akad. Nauk S.S.S.R.*, **1944**, [Khim.], (4), 201–208.—[In Russian.] (Cf. preceding abstract. In continuation of the discussion, M. examines the systems of nickel and cobalt with indium, tin, antimony, and tellurium. Structural investigation shows that all these systems possess phases of the NiAs type which are relatively displaced on the composition axis, but which form a continuous series from Ni_2In, with 66·6 at.-% of nickel, to $NiTe_2$, with 33·3 at.-% of nickel. In this homologous series a continuous change of lattice constants takes place. The nature of the bond ranges from the homopolar ionic type in the case of $NiTe_2$ to the metallic type in the case of Ni_2In.—V. K.

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MAKAROV, Ye. S.

"Crystal Chemistry of Phases with the Structures of NiAs-Type, Part I. Relations between the Structure Types of NiAs, CdJ_2 and Ni_{2In}," Iz. Ak. Nauk SSSR, Otdel. Khim. Nauk, Nos. 2-3, 1944.

Mbr., Inst. General and Inorganic Chemistry, AS

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A1-3, Crystal Sti

B1 26.

Crystal chemistry of phases with the structures of NiAs type. I. Relations between the structure types of NiAs, CdI_2, and Ni_2In. E. S. Makarov (*Bull. Acad. Sci. U.R.S.S., Cl. Sci. Chim.*, 1944, 114-121). The three structures are separate stages in the filling up of the same crystal lattice, with the less noble partner hexagonally close-packed. The CdI_2 type appears when half of the octahedral holes are filled and is the most open structure, the NiAs type is intermediate, and the Ni_2In type appears when all the holes are filled. The solid solutions formed in the alloys of Ni with Te, Sb, Sn, and In within the range 33.3 - 66.6 at -% of Ni connect all three types of structure through a continuous series. J. F. H.

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Form of the first Brillouin zone in the case of hexagonal structure of nickel arsenide type. E. S. Makarov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, **40**, 191—193).—The low or negative temp. coeff. of electrical conductivity in Fe–Ni–Sb alloys with Ni arsenide structure implies nearly complete filling up of the Brillouin zone, which should include ~2·5 electronic states per atom. Data from powder photographs show that the shape of the Brillouin zone is a combination of 3 types of plane, (022 — 112), (200 — 130), and (002), with vol. in the *K*-space $(32a^6 - 2c^6)/3\sqrt{(3a^4c)}$ and $(16a^6 - c^6).6a^4$ states per atom. Vals. for Fe–Sb (47·1 at.-% Sb), Co–Sb (48·2 at.-% Sb), and Ni–Sb (49·46 at.-% Sb) are 2·402, 2·372, and 2·386 states per atom. Overlapping into the second zone occurs across the (002) plane, and accounts for electrical properties and metallic character.

L. J. J.

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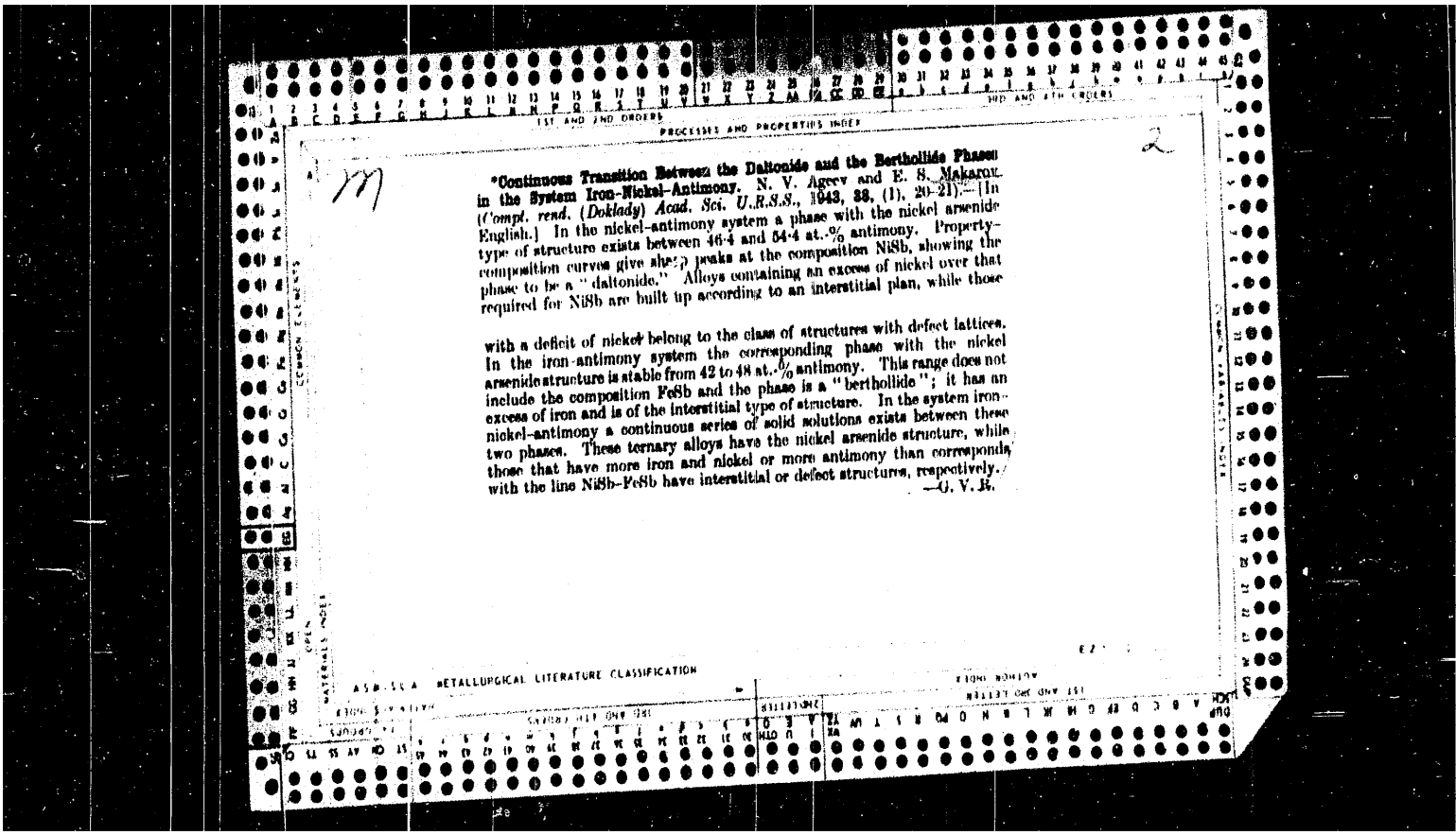

PROCESSES AND PROPERTIES INDEX

***Continuous Transition Between the Daltonide and the Berthollide Phases in the System Iron-Nickel-Antimony.** N. V. Ageev and E. S. Makarov. (*Compt. rend. (Doklady) Acad. Sci. U.R.S.S.*, 1943, **38**, (1), 20–21).—[In English.] In the nickel–antimony system a phase with the nickel arsenide type of structure exists between 46·4 and 54·4 at.-% antimony. Property–composition curves give sharp peaks at the composition NiSb, showing the phase to be a "daltonide." Alloys containing an excess of nickel over that required for NiSb are built up according to an interstitial plan, while those with a deficit of nickel belong to the class of structures with defect lattices. In the iron–antimony system the corresponding phase with the nickel arsenide structure is stable from 42 to 48 at.-% antimony. This range does not include the composition FeSb and the phase is a "berthollide"; it has an excess of iron and is of the interstitial type of structure. In the system iron–nickel–antimony a continuous series of solid solutions exists between these two phases. These ternary alloys have the nickel arsenide structure, while those that have more iron and nickel or more antimony than corresponds with the line NiSb–FeSb have interstitial or defect structures, respectively.

—O. V. K.

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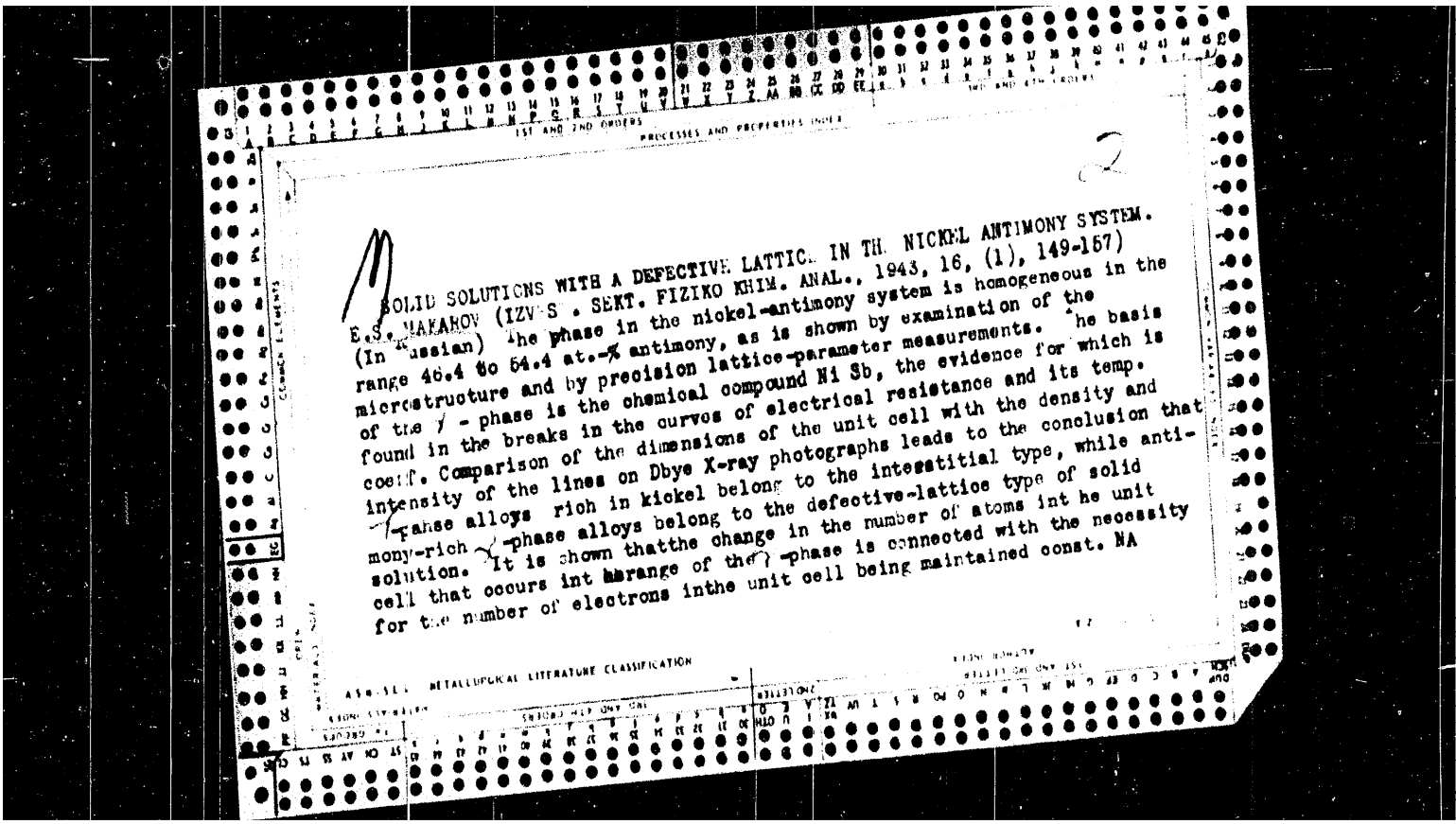

SOLID SOLUTIONS WITH A DEFECTIVE LATTICE IN THE NICKEL ANTIMONY SYSTEM.

E.S. MAKAROV (IZV. S. SEKT. FIZIKO KHIM. ANAL., 1943, 16, (1), 149-157)
(In Russian) The phase in the nickel-antimony system is homogeneous in the range 46.4 to 54.4 at.-% antimony, as is shown by examination of the microstructure and by precision lattice-parameter measurements. The basis of the γ - phase is the chemical compound Ni Sb, the evidence for which is found in the breaks in the curves of electrical resistance and its temp. coeff. Comparison of the dimensions of the unit cell with the density and intensity of the lines on Dbye X-ray photographs leads to the conclusion that γ-phase alloys rich in nickel belong to the intestitial type, while anti-mony-rich γ-phase alloys belong to the defective-lattice type of solid solution. It is shown thatthe change in the number of atoms int he unit cell that occurs int harange of the γ -phase is connected with the necessity for the number of electrons inthe unit cell being maintained const. NA

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AI · 6 · Kinetic Theory Thermodynamics

Relations between daltonide and berthollide phases in metallic systems. N. V. Ageev and E. S. Makarov (*J. Gen. Chem. Russ.*, 1943, **13**, 242—248).—The two phases are fundamentally of the same nature, and can pass continuously one into the other. Both owe their existence to formation of definite chemical compounds.

R. T.

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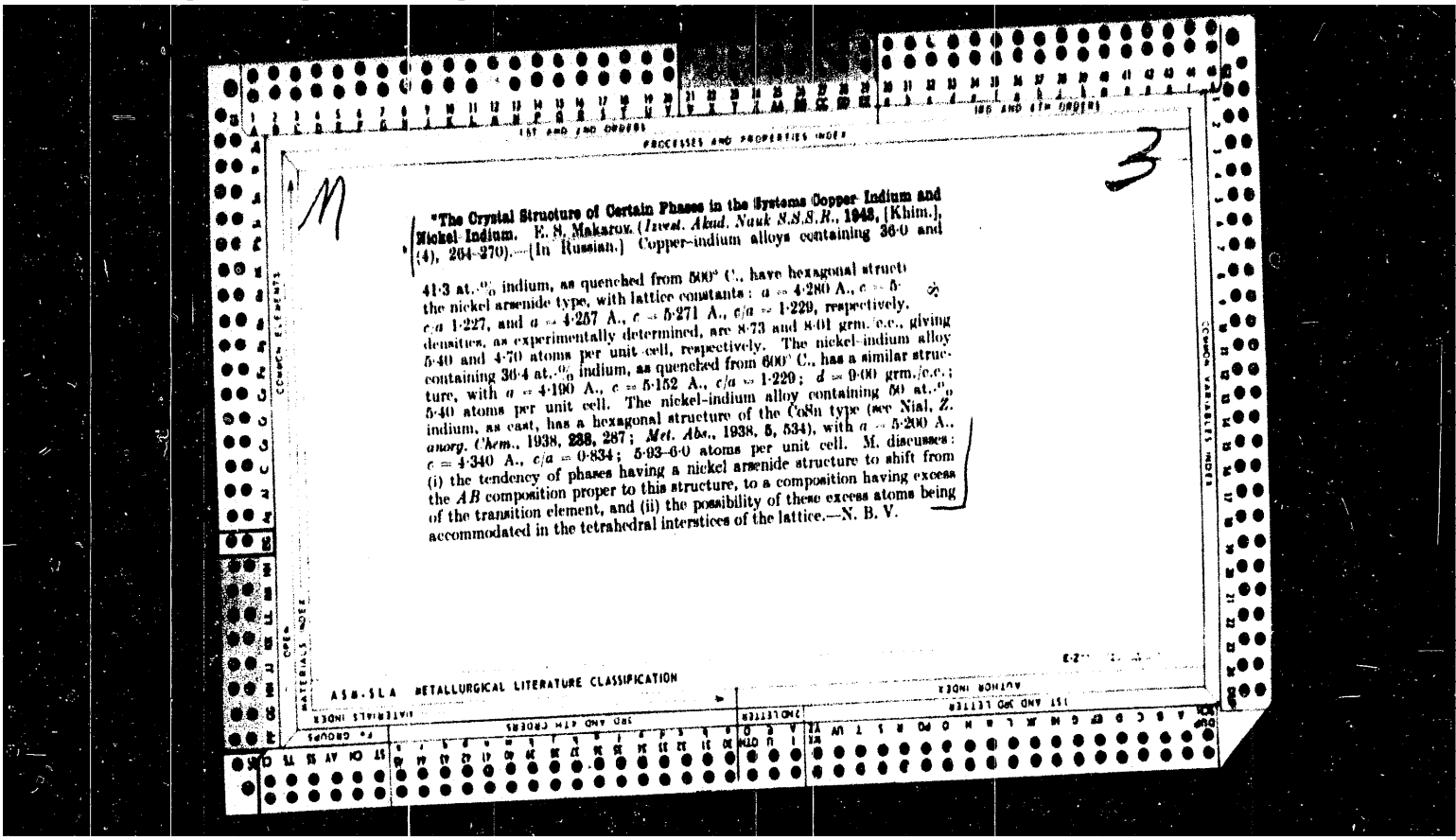

"The Crystal Structure of Certain Phases in the Systems Copper–Indium and Nickel–Indium. E. S. Makarov. (*Izvest. Akad. Nauk S.S.S.R.*, **1948**, [Khim.], (4), 264–270).—[In Russian.] Copper–indium alloys containing 36·0 and 41·3 at.-% indium, as quenched from 500° C., have hexagonal structu the nickel arsenide type, with lattice constants: $a = 4{\cdot}280$ A., $c = 5{\cdot}$ c/a 1·227, and $a = 4{\cdot}257$ A., $c = 5{\cdot}271$ A., $c/a = 1{\cdot}229$, respectively. densities, as experimentally determined, are 8·73 and 8·01 grm./c.c., giving 5·40 and 4·70 atoms per unit cell, respectively. The nickel–indium alloy containing 36·4 at.-% indium, as quenched from 600° C., has a similar structure, with $a = 4{\cdot}190$ A., $c = 5{\cdot}152$ A., $c/a = 1{\cdot}229$; $d = 9{\cdot}00$ grm./c.c.; 5·40 atoms per unit cell. The nickel–indium alloy containing 50 at.-% indium, as cast, has a hexagonal structure of the CoSn type (see Nial, *Z. anorg. Chem.*, 1938, **238**, 287; *Met. Abs.*, 1938, **5**, 534), with $a = 5{\cdot}200$ A., $c = 4{\cdot}340$ A., $c/a = 0{\cdot}834$; 5·93–6·0 atoms per unit cell. M. discusses: (i) the tendency of phases having a nickel arsenide structure to shift from the AB composition proper to this structure, to a composition having excess of the transition element, and (ii) the possibility of these excess atoms being accommodated in the tetrahedral interstices of the lattice.—N. B. V.

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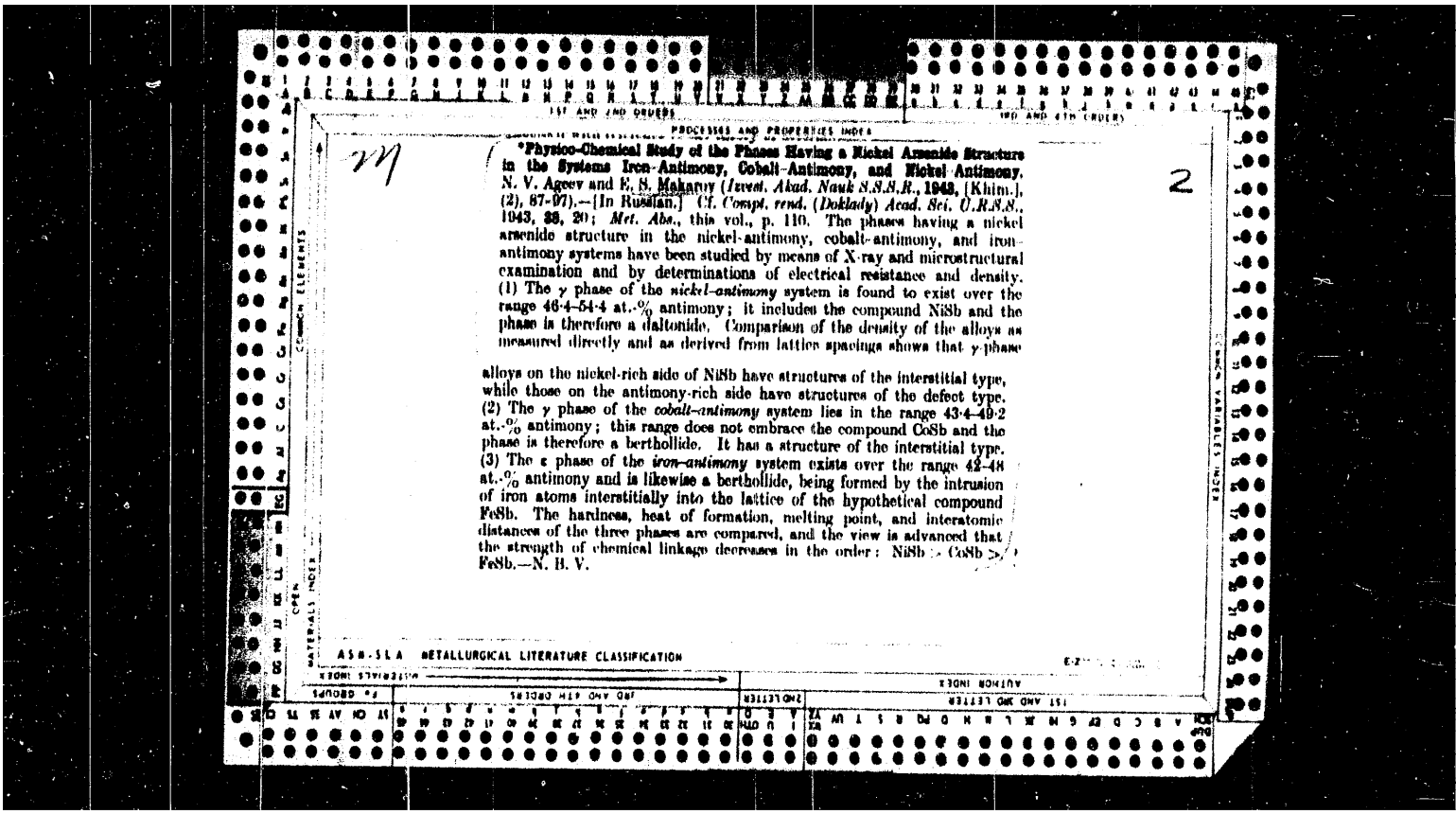

PROCESSES AND PROPERTIES INDEX

***Physico-Chemical Study of the Phases Having a Nickel Arsenide Structure in the Systems Iron-Antimony, Cobalt-Antimony, and Nickel-Antimony.** N. V. Ageev and E. S. Makarov (*Izvest. Akad. Nauk S.S.S.R.*, **1943**, [Khim.], (2), 87-97).—[In Russian.] Cf. *Compt. rend. (Doklady) Acad. Sci. U.R.S.S.*, **1943**, **38**, 20; *Met. Abs.*, this vol., p. 110. The phases having a nickel arsenide structure in the nickel-antimony, cobalt-antimony, and iron-antimony systems have been studied by means of X-ray and microstructural examination and by determinations of electrical resistance and density. (1) The γ phase of the *nickel-antimony* system is found to exist over the range 46·4–54·4 at.-% antimony; it includes the compound NiSb and the phase is therefore a daltonide. Comparison of the density of the alloys as measured directly and as derived from lattice spacings shows that γ-phase alloys on the nickel-rich side of NiSb have structures of the interstitial type, while those on the antimony-rich side have structures of the defect type. (2) The γ phase of the *cobalt-antimony* system lies in the range 43·4–49·2 at.-% antimony; this range does not embrace the compound CoSb and the phase is therefore a berthollide. It has a structure of the interstitial type. (3) The ε phase of the *iron-antimony* system exists over the range 42–48 at.-% antimony and is likewise a berthollide, being formed by the intrusion of iron atoms interstitially into the lattice of the hypothetical compound FeSb. The hardness, heat of formation, melting point, and interatomic distances of the three phases are compared, and the view is advanced that the strength of chemical linkage decreases in the order: NiSb > CoSb > FeSb.—N. B. V.

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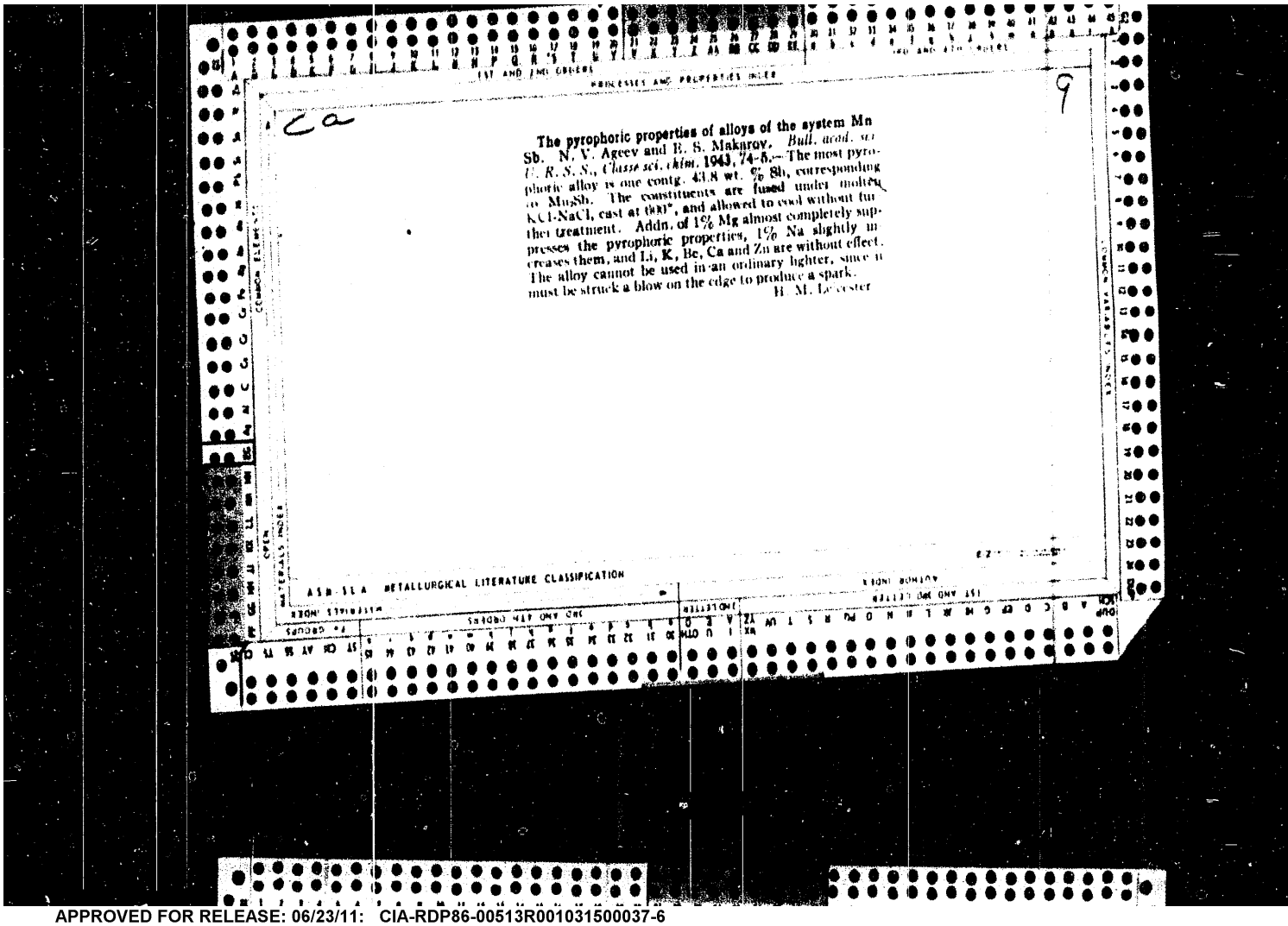

The pyrophoric properties of alloys of the system Mn Sb. N. V. Ageev and B. S. Makarov. *Bull. acad. sci. U. R. S. S., Classe sci. chim.* 1943, 74-8.—The most pyrophoric alloy is one contg. 43.8 wt. % Sb, corresponding to Mn_3Sb. The constituents are fused under molten KCl-NaCl, cast at 980°, and allowed to cool without further treatment. Addn. of 1% Mg almost completely suppresses the pyrophoric properties, 1% Na slightly increases them, and Li, K, Be, Ca and Zn are without effect. The alloy cannot be used in an ordinary lighter, since it must be struck a blow on the edge to produce a spark.

H. M. Leicester

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Roentgenographic determination of structure of ternary solid solutions of magnesium, silicon, and aluminum. V. G. KUZNETSOV AND E. S. MAKAROV. *Izvest. Sektora Fiz.-Khim. Anal., Inst. Obshchel & Neorg. Khim.*, 13, 177-90 (1940); *Khim. Referat. Zhur.*, 4 [9] 35-36 (1941).—Using the precision method of Preston, the authors determined the parameters of the lattice of the ternary solid solution Al-Mg-Si for 6 radial cuts starting at Al and going toward the side Mg-Si up to 2.2 wt. % (Mg+Si) as well as for Al-Si alloys up to 2.2 wt. % Si. Isotherms were constructed for the solubility of Mg and Si in Al at 550°, 500°, 400°, and 200°. The solubility of Mg and Si in Al at 200° is not more than 0.1% of the sum (Mg + Si) of the region delineated by the system Al-Si-Mg_2Si. The difference in the nature of experimental and calculated curves for the parameters of the lattice, assuming an atomic structure of a solid solution for alloys annealed from 550°, leads to the belief that the solid solution Al-Mg_2Si is molecular in its structure. On Debye diagrams of alloys annealed after heating at 550° and 200°, only lines corresponding to the lattice of Al were observed. Annealed and slowly cooled alloys containing 2.2% of Mg + Si and located on the pseudobinary and adjacent sections show, on Debye diagrams, weak additional lines corresponding to the lattice Mg_2Si. M. Ho

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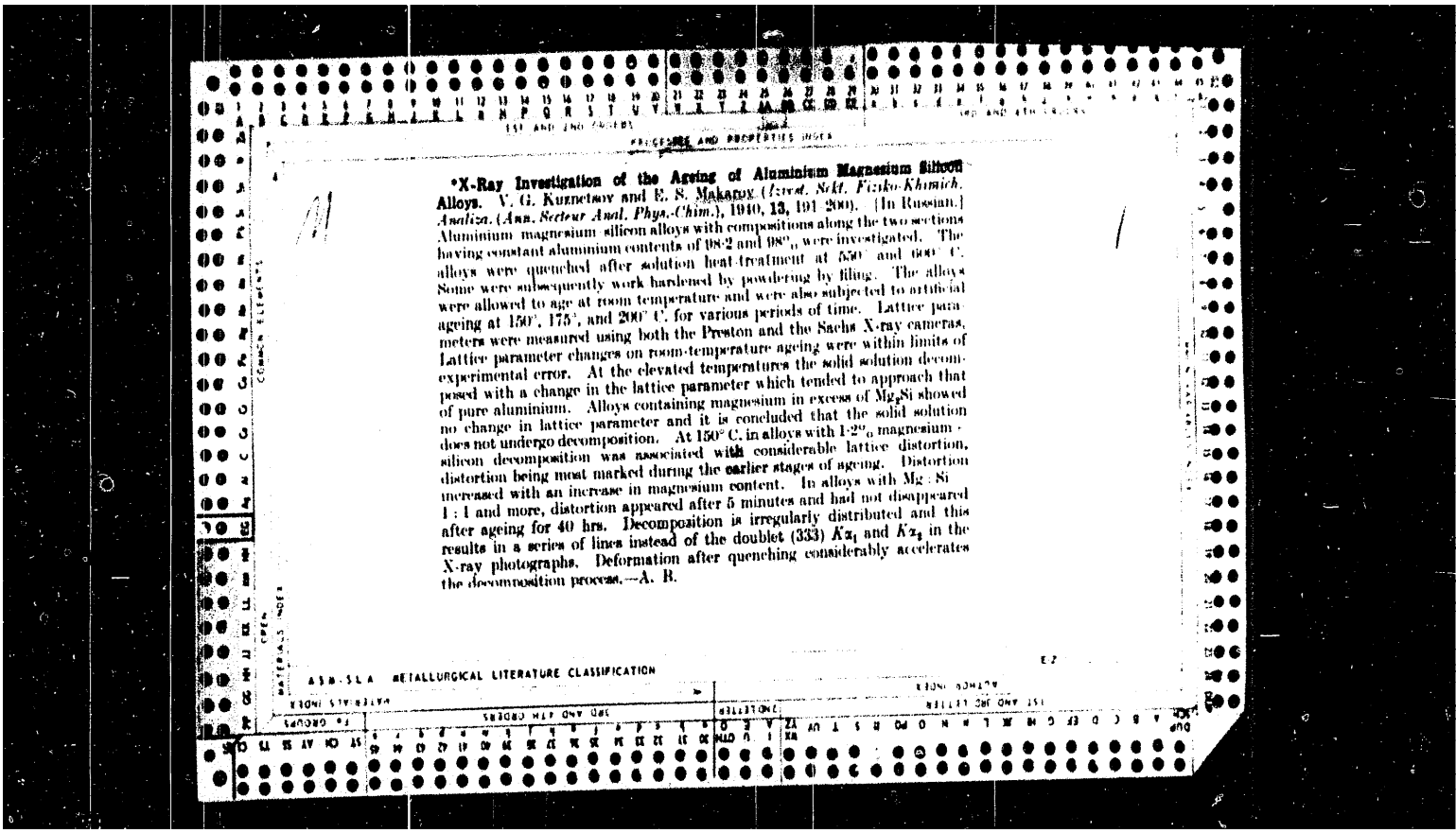

***X-Ray Investigation of the Ageing of Aluminium Magnesium Silicon Alloys.** V. G. Kuznetsov and E. S. Makarov (*Izvest. Sekt. Fiziko-Khimich. Analiza.* (*Ann. Secteur Anal. Phys.-Chim.*), 1940, **13**, 191–200). [In Russian.] Aluminium–magnesium–silicon alloys with compositions along the two sections having constant aluminium contents of 98·2 and 98% were investigated. The alloys were quenched after solution heat-treatment at 550° and 600° C. Some were subsequently work hardened by powdering by filing. The alloys were allowed to age at room temperature and were also subjected to artificial ageing at 150°, 175°, and 200° C. for various periods of time. Lattice parameters were measured using both the Preston and the Sachs X-ray cameras. Lattice parameter changes on room-temperature ageing were within limits of experimental error. At the elevated temperatures the solid solution decomposed with a change in the lattice parameter which tended to approach that of pure aluminium. Alloys containing magnesium in excess of Mg_2Si showed no change in lattice parameter and it is concluded that the solid solution does not undergo decomposition. At 150° C. in alloys with 1·2% magnesium–silicon decomposition was associated with considerable lattice distortion, distortion being most marked during the earlier stages of ageing. Distortion increased with an increase in magnesium content. In alloys with Mg : Si 1 : 1 and more, distortion appeared after 5 minutes and had not disappeared after ageing for 40 hrs. Decomposition is irregularly distributed and this results in a series of lines instead of the doublet (333) Kx_1 and Kx_2 in the X-ray photographs. Deformation after quenching considerably accelerates the decomposition process.—A. B.

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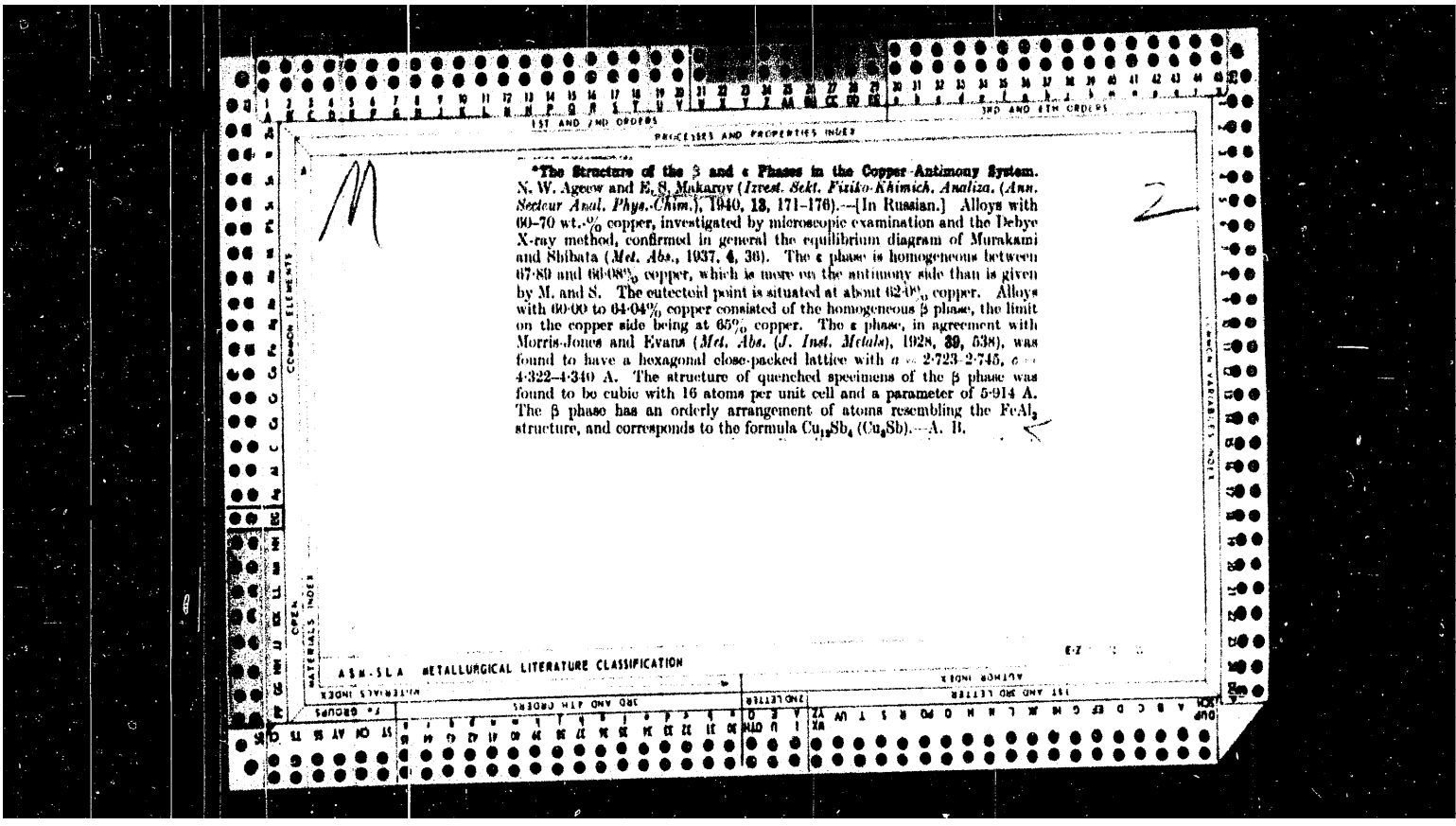

***The Structure of the β and ε Phases in the Copper-Antimony System.** N. W. Ageew and E. S. Makarov (*Izvest. Sekt. Fiziko-Khimich. Analiza. (Ann. Secteur Anal. Phys.-Chim.)*, 1940, **13**, 171–176).—[In Russian.] Alloys with 60–70 wt.-% copper, investigated by microscopic examination and the Debye X-ray method, confirmed in general the equilibrium diagram of Murakami and Shibata (*Met. Abs.*, 1937, **4**, 36). The ε phase is homogeneous between 67·89 and 68·08% copper, which is more on the antimony side than is given by M. and S. The eutectoid point is situated at about 62·0% copper. Alloys with 60·00 to 64·04% copper consisted of the homogeneous β phase, the limit on the copper side being at 65% copper. The ε phase, in agreement with Morris-Jones and Evans (*Met. Abs.* (*J. Inst. Metals*), 1928, **39**, 538), was found to have a hexagonal close-packed lattice with a = 2·723–2·745, c = 4·322–4·340 A. The structure of quenched specimens of the β phase was found to be cubic with 16 atoms per unit cell and a parameter of 5·914 A. The β phase has an orderly arrangement of atoms resembling the $FeAl_3$ structure, and corresponds to the formula $Cu_{13}Sb_4$ (Cu_3Sb).—A. B.

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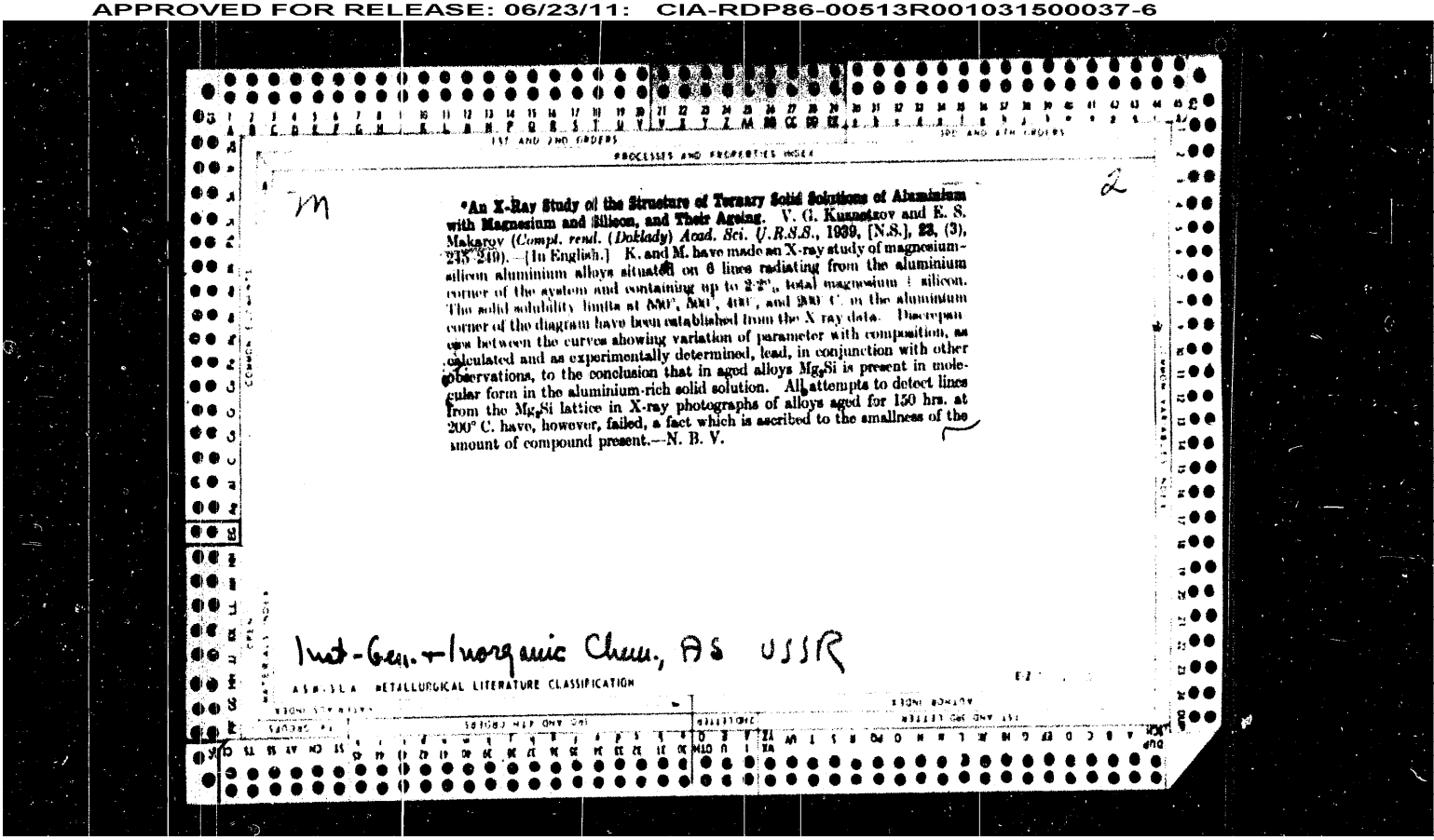

PROCESSES AND PROPERTIES INDEX

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***An X-Ray Study of the Structure of Ternary Solid Solutions of Aluminium with Magnesium and Silicon, and Their Ageing.** V. G. Kuznetzov and E. S. Makarov (*Compt. rend.* (*Doklady*) *Acad. Sci. U.R.S.S.*, 1939, [N.S.], **23**, (3), 235–240).—[In English.] K. and M. have made an X-ray study of magnesium-silicon aluminium alloys situated on 6 lines radiating from the aluminium corner of the system and containing up to 2·2% total magnesium + silicon. The solid solubility limits at 550°, 500°, 400°, and 200° C. in the aluminium corner of the diagram have been established from the X ray data. Discrepancies between the curves showing variation of parameter with composition, as calculated and as experimentally determined, lead, in conjunction with other observations, to the conclusion that in aged alloys Mg_2Si is present in molecular form in the aluminium-rich solid solution. All attempts to detect lines from the Mg_2Si lattice in X-ray photographs of alloys aged for 150 hrs. at 200° C. have, however, failed, a fact which is ascribed to the smallness of the amount of compound present.—N. B. V.

Inst-Gen.+Inorganic Chem., AS USSR

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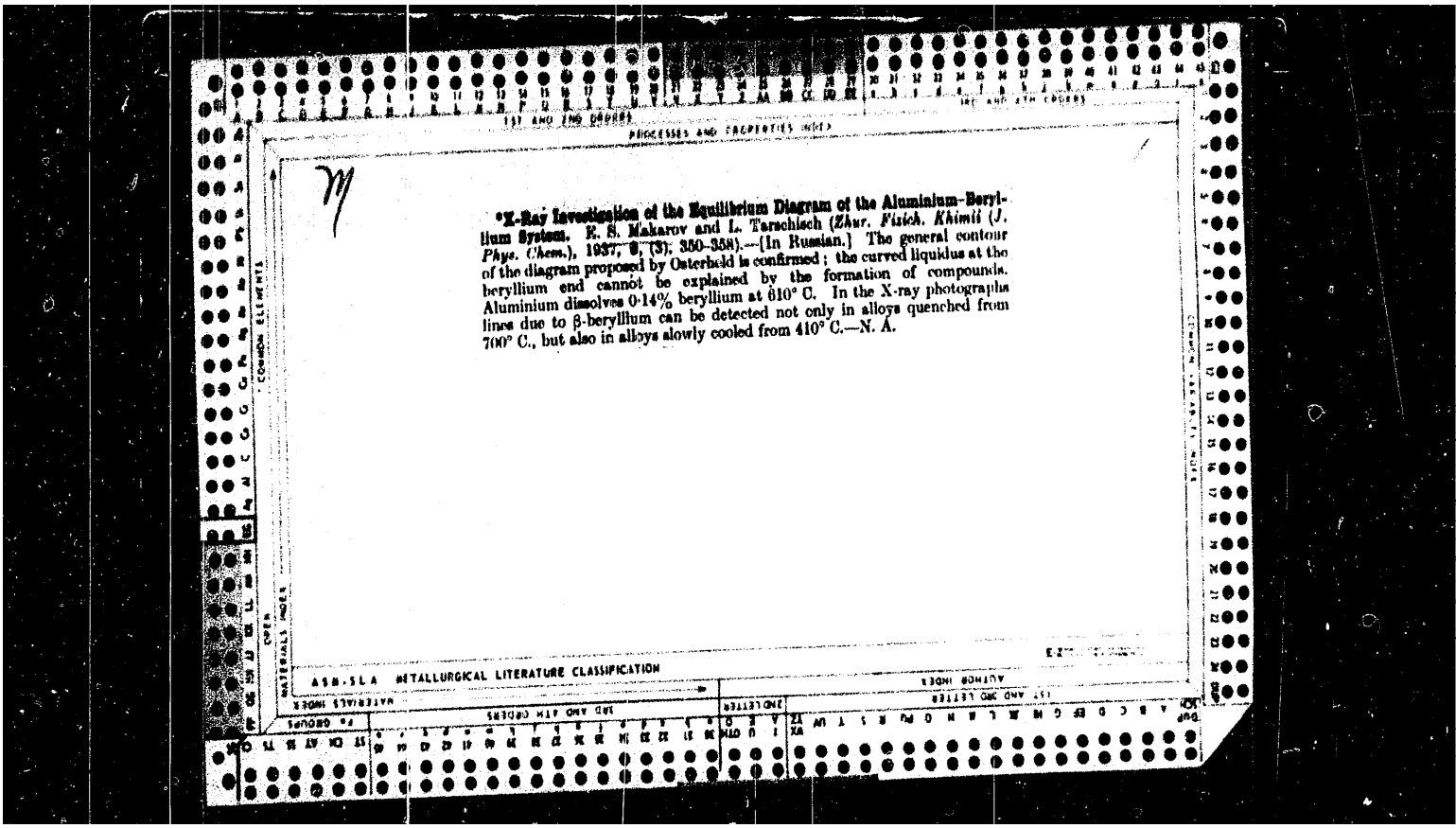

***X-Ray Investigation of the Equilibrium Diagram of the Aluminium-Beryllium System.** K. S. Makarov and L. Tarachisch (*Zhur. Fizich. Khimii* (*J. Phys. Chem.*), 1937, **9**, (3), 350–358).—[In Russian.] The general contour of the diagram proposed by Osterheld is confirmed; the curved liquidus at the beryllium end cannot be explained by the formation of compounds. Aluminium dissolves 0·14% beryllium at 610° C. In the X-ray photographs lines due to β-beryllium can be detected not only in alloys quenched from 700° C., but also in alloys slowly cooled from 410° C.—N. A.

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MAKAROV, Yevgeniy Markovich; KOROBOV, P.I., red.; ROZEN, E.A., tekhn.red.

[Father of factories; outline history of the Ural Machine Plant] Otets zavodov; ocherki iz istorii Uralmashzavoda. Moskva, Izd-vo "Sovetskaia Rossiia," 1960. 149 p. (MIRA 13:7)
(Sverdlovsk--Machinery industry)

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GOL'DANSKIY, Vitaliy Iosifovich; MAKAROV, Yevgeniy Fredovich; CHERNIKOVA, V.K., red.

[New trends in nuclear chemistry] Novye napravleniia iadernoi khimii. Moskva, Izd-vo "Znanie," 1964. 51 p. (Novoe v zhizni, nauke, tekhnike. XI Seriia: Khimiia, no.12) (MIRA 18:1)

1. Chlen-korrespondent AN SSSR (for Gol'danskiy).

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MAKAROV, Ye. I.

94-1-7/24

AUTHORS: Fidel'man, N.L., Engineer and Makarov, Ye.I., Engineer.

TITLE: An Unattended Fuel Oil Pump Room (Mazutonasosnaya bez obsluzhivayushchego personala)

PERIODICAL: Promyshlennaya Energetika, 1958, No.1, pp. 16 - 17 (USSR)

ABSTRACT: This brief note describes the way in which the fuel-oil pump-room of the Chelyabinsk Forge and Press Works (Chelyabinskiy kuznechno-pressovoy zavod) was made automatic. When the pressure alters in the fuel-oil pressure line, there is a change in the pressure of transformer oil in a tank which operates a membrane-type pressure-regulator. For purposes of remote control of fuel-oil pressure and temperature, a contact manometer and light-signal is installed. The oil-pressure installation that delivers oil to the regulator operates at a pressure of 6 kg/cm^2 with an output of 14 litres/min. It is driven by a motor of 0.8 kW. The total cost of making the pump room automatic was about 1 600 roubles and it has been operating reliably unattended for more than a year. There is 1 figure.

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for the different groups of particles and is found to be 120, 130, 135, and 140K respectively, as well as for tin atoms in the surface layer (100K), which had a thickness of 5 lattice constants. Arguments favoring the decrease of f' accompanying smaller particles and its strong temperature dependence to be associated with surface phenomena and not with any frequency change in the internal-atom spectra for these particles are presented. The authors thank V. A. Myuller for assisting in the preparation of some samples, Yu. I. Fedorov for the electron-microscope determination of the particle sizes, and Yu. I. Petrov for valuable discussions. Orig. art. has: 2 figures and 1 table.

SUB CODE: 20/ SUBM DATE: 24Feb66/ ORIG REF: 004/ OTH REF: 009

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L 08180-67 EWT(m)/EWP(t)/ETI IJP(c) JD
ACC NR: AP6024870 SOURCE CODE: UR/0056/66/051/001/0118/0120

AUTHOR: Suzdalev, I. P.; Gen, M. Ya.; Gol'danskiy, V. I.; Makarov, Ye. F.

ORG: Institute of Chemical Physics, Academy of Sciences SSSR (Institute khimicheskoy fiziki Akademii nauk SSSR)

TITLE: Nuclear gamma resonance in highly dispersed tin

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 1, 1966, 118-120

TOPIC TAGS: tin, nuclear resonance, aerosol, Mossbauer effect, Mossbauer spectrum, temperature dependence

ABSTRACT: The Mossbauer effect was investigated in highly dispersed tin particles having diameters of 250, 370, 600, and 1550 Å. The dispersed tin was produced by evaporating liquid drops in a helium or argon atmosphere and condensing the vapor into aerosol particles. The particle size was regulated by the rate of flow and also depended on the gas. The mean particle size was determined with an electron microscope. The spectrum for the highly dispersed tin consisted of a single line characteristic of ordinary polycrystalline β-Sn with a chemical shift of 2.6 mm/sec (relative to SnO_2). The probability of the Mossbauer effect f' was measured as a function of the temperature (T) and particle diameter (d) from the area under the spectral absorption curve. The results show that f' diminishes with decreasing particle diameter, starting with d ≈ 600 Å. The temperature dependence is steeper. The variation with particle sizes is connected with the influence of the surface. The Debye temperature is determined

Card 1/2

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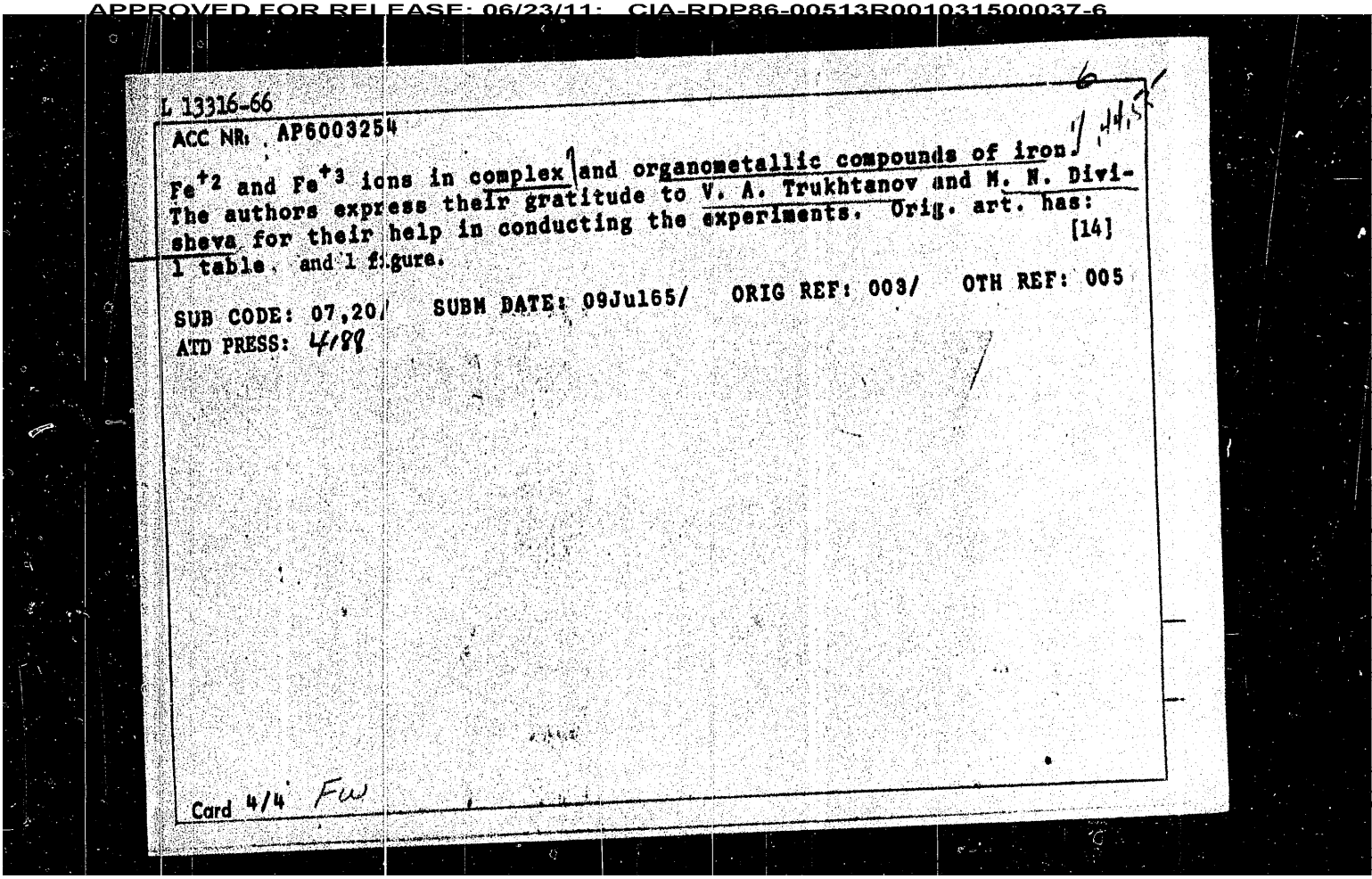

L 13316-66

ACC NR: AP6003254

Fe^{+2} and Fe^{+3} ions in complex and organometallic compounds of iron.

The authors express their gratitude to V. A. Trukhtanov and M. N. Divisheva for their help in conducting the experiments. Orig. art. has: [14] 1 table, and 1 figure.

SUB CODE: 07,20/ SUBM DATE: 09Jul65/ ORIG REF: 003/ OTH REF: 005
ATD PRESS: 4/89

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L 13316-66

AC NR: AP6003254

kinetics and the mechanism of the reactions with the participation of

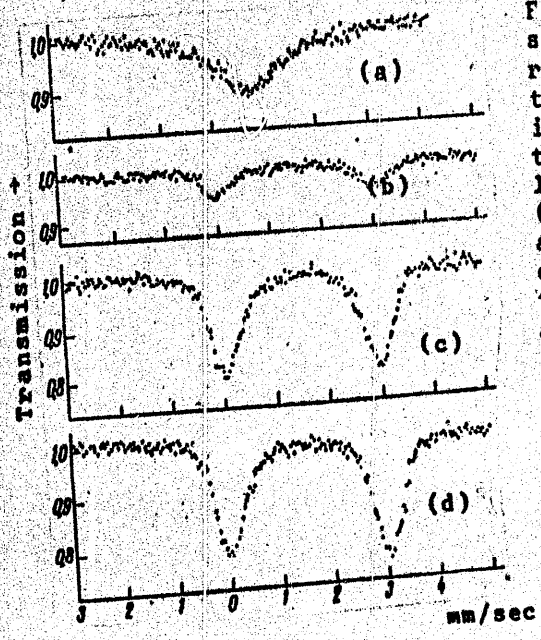

Fig. 1. a--Mossbauer spectrum of solution containing Fe^{+3} ions, enriched in ^{57}Fe; b--Mossbauer spectrum of solution containing Fe^{+2} ions of natural isotopic composition; c--Mossbauer spectrum of solution produced by mixing solutions (a) and (b), frozen several minutes after mixing; d--Mossbauer spectrum of solution produced by mixing solutions (a) and (b), frozen 12 hrs after mixing.

Card 3/4

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trodynamic 500-channel gamma resonance spectrometer. Cobalt-57 was used as the gamma source. All measurements were taken at liquid nitrogen temperature. The two starting solutions contained: 8 mg of Fe^{+3} ions 60% enriched with Fe^{57} isotope and 12 mg Fe^{+2} with natural content of Fe^{57}. After obtaining the Mossbauer spectra on the starting solutions they were mixed in a cuvette and frozen at 80°K. After mixing, the spectral parameters of the solution are characteristic for Fe^{+2} with higher line intensities than in the starting solution of Fe^{+2} (see fig. 1) indicating increase of the concentration of ^{57}Fe in the Fe^{+2} form due to the electron exchange reaction

$$^{57}Fe^{+3} + Fe^{+2} \rightleftarrows {}^{57}Fe^{+2} + Fe^{+3}$$

The Fe^{+3} line is weak due to the very small f' for Fe^{+3} ion and the high degree of electron exchange. Changes in the spectrum in the course of the 2 hr measurement period indicate that some electron exchange takes place in the frozen solutions at 80°K. The experiment shows the effectiveness of this method in the investigation of electron and isotope exchange. In the investigated system electron exchange between Fe^{+2} and Fe^{+3} proceeds rapidly, but at a measurable rate. It is planned in the future to use the method for the quantitative investigation of the

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L 13316-66 EWT(1)/EWT(m)/EWP(j)/T IJAAP/IJP(c) RM

ACC NR: AP6003254 SOURCE CODE: UR/0020/65/165/006/1347/1349

60
54
13

AUTHOR: Stukan, R. A.; Gol'danskiy, V. I. (Corresponding member AN SSSR); Makarov, Ye. F.

ORG: Institute of Chemical Physics, Academy of Sciences, SSSR (Institut khimicheskoy fiziki Akademii nauk SSSR)

TITLE: The analytical use of the Mossbauer effect in the tagged atom method

21,44,55

SOURCE: AN SSSR. Doklady, v. 165, no. 6, 1965, 1347-1349

TOPIC TAGS: iron compound, Mossbauer effect, charge exchange, isotope, Mossbauer spectrum, nuclear reaction

ABSTRACT: The method consists in successively enriching each of the reacting components in the given complex system with the Mossbauer isotope of the element which is in the given component (for example Fe^{57}, Sn^{119}) and then studying the changes in the Mossbauer spectrum of the reaction products as compared with the spectrum of the natural isotope components. Variations can be extremely fruitful in the study of rapid redox processes or isotope exchange and also for the study of chemical processes at low temperatures. The experiments were conducted with Fe^{+2} and Fe^{+3} ions in Cl^-- and SO_4^{2-}-containing media at pH ~1. The Mossbauer spectra were measured on an elec-

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Card 1/4

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L 15674-66

ACC NR: AP6000191

3

that the former is attached to the surface by physical adsorption, and the latter is held by chemisorption. With increasing temperature, the doublet components on the spectrum (which consist of a singlet and a doublet) become asymmetrical, and the electric field gradient at the Sn^{119} nucleus increases over the value for crystalline SnO. Estimates are presented for the absolute values of the rms displacements of the molecule $SnO_2 \cdot nH_2O$ on the surface, and of the tin atoms within the molecules. The energy of the zero-point vibrations of the tin atoms and molecules, the energy at which the binding between the molecule and adsorption center on the surface vanishes, the absolute value of the rms displacement of the tin atom within the SnO molecule normally and parallel to the surface, and the temperature dependence of these quantities are also estimated. Authors thank I. Ye. Neymark, V. M. Chertov, and I. Ya. Garzanov for interest in the work and for help with the experiments, and Yu. M. Kagan for a discussion of the results. Orig. art. has: 4 figures and 4 formulas.

SUB CODE: 07,20/ SUBM DATE: 08Jan65/ ORIG REF: 011/ OTH REF: 005

Card 2/2 MJS

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L 15674-66 EWT(m)/T/EWP(t) IJP(c) JD
ACC NR: AP6000195 SOURCE CODE: UR/0056/65/049/005/1424/1430

AUTHOR: Suzdalev, I. P.; Gol'danskiy, V. I.; Makarov, Ye. F.; Plachinda, A. S.; Korytko, L. A.

ORG: Institute of Chemical Physics, Academy of Sciences, SSSR (Institut khimicheskoy fiziki Akademii nauk SSSR)

TITLE: Investigation of the dynamics of motion of tin atoms on a silica gel surface by means of the Mossbauer effect

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 5, 1965, 1424-1430

TOPIC TAGS: Mossbauer effect, tin, chemical valence, silica gel, atom, adsorption, temperature dependence, electric field, ion exchange, calcium, cryostat, temperature measurement, gamma spectrometer, chemisorption

ABSTRACT: The authors studied the dynamics of motion of tin atoms adsorbed on a silica gel surface with specific area 300 m^2/g and particle diameter ~100 A. A monomolecular layer of tin was produced on the surface by successive ion exchange of the hydrogen atoms contained in the hydroxyl on the surface, first with Ca^{2+}, and then with Sn^{2+}. A special cryostat was constructed for the temperature measurement which could maintain any temperature between 90 and 300K accurate to 0.1°. All measurements were made with the nuclear gamma-ray resonance spectrometer described by the authors earlier (Zavodskaya laboratoriya, no. 12, 1965). The experimental results indicate that the tin atoms exist on the surface in two states, tetravalent and divalent. The temperature dependence of the intensity of the Mossbauer effect shows

Card 1/2

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SUZDALEV, I.P.; MAKAROV, Ye.F.; GARZANOV, I. Ya.; KORYTKO, L.S.

Oxidation of finely dispersed tin studied by means of Mössbauer effect. Kin. i kat. 6 no. 6:1108-1111 N-D '65 (MIRA 19:1)

1. Institut khimicheskoy fiziki AN SSSR. Submitted March 9, 1965.

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BERSUKER, I.B.; GOL'DANSKIY, V.I.; MAKAROV, Ye.F.

Distribution of an electron cloud in tin tetrahalides from the data of chemical shifts of Mössbauer spectra and nuclear quadrupole resonance spectra. Teoret. i eksper. khim. 1 no. 5:678-680 S-O '65 (MIRA 19:1)

1. Institut khimicheskoy fiziki AN SSSR, Moskva. Submitted June 30, 1965.

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L 13571-63

ACCESSION NR: AP3000184

2

when the test samples are saturated or directly placed into the chrome-plating mixture rather than placing them into the powder mixture. Fortunately, the grains of ferric chromate protect the iron from losses which would result in the formation of halogenates. In addition to the above, the formation of chromium halogenates directly near the surface of iron results in a higher local concentration of chromium. Thus, in order to obtain a more intensive adsorption of chromium on the surface of iron, the test samples must be placed into the chrome-plating mixture with the addition of ammonium iodide to the mixture. Orig. art. has: 1 figure, and several formulas.

ASSOCIATION: Odesskoye vysshaye inzhenernoye morskoye uchilishche (Higher Marine Engineering School of Odessa)

SUBMITTED: 23May62 DATE ACQ: 12Jun63 ENCL: 00

SUB CODE: CH NO REF SOV: 009 OTHER: 007

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L 13571-63 EWF(q)/EWT(m)/BDS AFFTC/ASD JD

ACCESSION NR: AP3000184 S/0080/63/036/004/0800/0806

AUTHOR: Titov, V. K.; Makarov, Ye. F.

TITLE: Effect of halide selection on the chrome-plating of iron

SOURCE: Zhurnal prikladnoy khimii, v. 36, no. 4, 1963, 800-806

TOPIC TAGS: chrome-plating technique

ABSTRACT: The experimental study shows that by increasing the atomic number of the halide which is introduced into the chrome-plating mixture, the quantity of chromium adsorbed on the surface of iron increases during the chrome plating process while the exchange factor m is expressed as follows: m = q sub 1/A sub 1 : q sub 2/A sub 2 where q sub 1 and q sub 2 is the weight of adsorbed chromium and lost iron respectively. A sub 1 and A sub 2 are their atomic weights. Thermodynamic calculation showed that the increase of quantity of chromium adsorbed when the change is made from fluoride to iodide is explained by the fact that, with an increase of the atomic number of a halide, a higher concentration of chromium halide in the gaseous form is observed. At the same time, the decrease of exchange factor m is explained by the decrease of chromium concentration or iron which are reduced by hydrogen. Best results are obtained

Card 1/2

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The coating of iron and steel ...

3 x 10-2 mm Hg has no appreciable effect, high carbon steels absorbing less Al than Armco iron. The short term oxidation resistance at 900°C, of iron and steel treated by this process has been improved by a factor of 9-12. There are 5 figures and 3 tables.

SUBMITTED: July 18, 1961

Card 2/2

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

S/080/62/035/008/001/009
D202/D308

AUTHORS: Titov, V.K., and Makarov, Ye.F.

TITLE: The coating of iron and steel with aluminum by vacuum evaporation

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 8, 1962, 1748-1752

TEXT: The authors present the results of their study of this process, stating that their method possesses the following advantages over conventional aluminizing processes: 1) The percentage of Al in the diffusion layer is lower, 2) the coated surface remains plastic and the thickness of the deposit can be controlled precisely, 3) the surface is clean and even and the volume increase of coated tools is very small. The method requires however a complicated and expensive equipment. The depth of the diffusion layer varies between 200 and 230 μ; the Al content is up to 7 %; the increase of temperature markedly increases the Al content; the distribution curve of Al in the layer has two branches corresponding to Al diffusion into α - and β - Fe. The lowering of vacuum from 3 x 10-5 to

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On the mechanism of metal siliciding

tor's note: Me_2 is erroneously written for Me_b in II in the text]. By chemical and X-ray analysis, it is shown that in the case of iron, V is most important (giving up to 78 % Si) and in the case of nickel it is less important (up to 50 % Ni). II second stage and IV are more important for nickel (10 - 50 % Si) than for iron (10 - 15 % Si). In the case of copper the first stage of II is of the greatest importance. There is 1 table and 8 references: 3 Soviet-bloc and 5 non-Soviet-bloc. The reference to the English-language publication reads as follows: F.D. Rossini and oth., Selected Values of Chemical Thermodynamic Properties, Part 1, Circular of the National Bureau of Stand., 1952, 50.

PRESENTED BY: I.M. Frantsevich, Academician AS UkrSSR

SUBMITTED: May 22, 1961

Card 2/2

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D251/D303

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AUTHORS: Titov, V.K., and Makarov, Ye.F.

TITLE: On the mechanism of metal siliciding

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 1, 1962, 50 - 53

TEXT: On the basis of thermodynamic experiments and calculations the authors discuss the siliciding of iron, copper and nickel in the vapor phase. The experimental process is carried out in a two-zone furnace, the gas phase consisting of a mixture of $SiCl_4$ with argon at partial pressure 0.263 at. In the first zone of the furnace at temperature t_1 it is assumed that the reaction I. $SiCl_4$ (gas) + Si (solid) = $2SiCl_2$ (gas) takes place. For the second zone at temperature $t_2 \leqslant t_1$, the following reactions are proposed: II. $2SiCl_2$ + x Me (solid) = Si (alloyed with Me) + $SiCl_4$ (gas); III. $SiCl_4$ (gas) + b Me (solid) = $SiCl_2$ (gas) + Me_2Cl_2; IV. $SiCl_2$ (gas) + x Me (solid) = Si (alloyed with Me) + Me_bSl_2 (gas); V. $SiCl_4$ (gas) + xMe (solid) = Si (alloyed with Me) + Me_bCl_2 (gas) [Abstrac-

Card 1/2

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Diffusion Saturation of ....

the case of saturation with Sn and relatively high in the case of saturation with Sb. Saturation with Sn should be carried out at 1 050 - 1 150 °C for 2 hours, whilst the optimum saturation temperature for Sb is about 550 °C (3 hrs) and, in both cases, a vacuum of 1 mm Hg is sufficient. [Abstracter's note: this is a slightly abridged translation.) There are 5 figures, 5 tables and 3 Soviet references.

ASSOCIATION: Nikolayevskiy korablestroitel'nyy institut i Odesskoye vyssheye inzhenernoye morskoye uchilishche (Nikolayev Ship-building Institute and Odessa Higher Marine-engineering School)

Card 5/6

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Diffusion Saturation of ....

cementite does not absorb antimony and its presence in the steel reduces the active surfaces of the specimens. Corrosion tests on various steels showed that their resistance-to-corrosion in a 1% solution of HNO_3 increased by a factor of 3 and corrosion of commercial iron in a 10% solution of NaCl decreased by a factor of about 2. In the initial state, the weight loss after 1 and 3 days, respectively, amounted to 0.27 and 0.59 mg/cm^2 for commercial iron in a 10% NaCl solution and the respective values for Sb-saturated specimens were 0.18 and 0.33 mg/cm^2. No increase of the resistance-to-corrosion of steel saturated with Sb was observed in a 10% solution of HCl and H_2SO_4. The following conclusions are arrived at:

iron and steel can be saturated with Sb or Sn by evaporation in vacuum. The diffused Sn represents a solid solution of substitution of Sn in Fe, whilst the Sb forms a solid solution corresponding approximately to the phase FeSb. In both cases, an increase in volume is observed which is slight in

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Diffusion Saturation of ....

range of the γ-iron stops extending at a carbon content of about 0.8%. The results of corrosion tests (in a 1% solution of HCl, in a 0.5% solution of NaCl and a 1% solution of H_2SO_4) of specimens saturated with Sn at 1 050 °C for 4 hours show that the resistance-to-corrosion in a 1% solution of HCl or H_2SO_4 increases 3-5-fold but does not change greatly in a 0.5% solution of NaCl. An antimony layer, produced by diffusion, has a small depth, is hard and brittle (the microhardness being 380 compared with 70 kg/mm^2 of the base material) and there is a sharply defined boundary relative to the base metal. The quantity of absorbed antimony and the increase in volume are considerable; the calculated average antimony concentration in the layer is about 68%, corresponding to the compound FeSb. With increasing temperature of the process, the brittleness of the diffusion layer increases and the surface of the specimens becomes less smooth. The optimum saturation temperature is 500 - 600 °C. The antimony saturation did not change greatly when the vacuum was reduced to 1 mm Hg. With increasing carbon content the antimony saturation (at 550 °C for 3 hours) of the steel became less. It can be assumed that

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Diffusion Saturation of ....

The diffusion layer has a columnar structure and there is a line of separation between the layer and the base material. The curve characterising the change in the tin concentration along the depth of the diffusion layer has two sections, one which corresponds to the distribution of tin diffusing into α-iron, whilst the other corresponds to the diffusion into γ-iron. If the vacuum is only 1 mm Hg, the quantity of tin absorbed at 1 050 °C during 6 hours decreases from 2.21 - 1.82 mg/cm^2 and the depth of the diffusion layer decreases from 100 to 80 μ. In the case of saturation of carbon steel it was found that the depth of the diffusion layer, the quantity of the absorbed tin and the increase in volume would be less with increasing carbon content up to 0.8% (Table 1). This is attributed to the fact that the range of γ-iron increases with increasing carbon content. Since the coefficient of diffusion of tin and γ-iron is lower than that of α-iron, the absorption of tin will be less intensive. Apparently the

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26571
S/129/61/000/008/004/015
E073/E335

AUTHORS: Titov, V.K. and Makarov, Ye.F.

TITLE: Diffusion Saturation of Iron and Steel with Tin and Antimony

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, 1961, No. 8, pp. 18 - 22

TEXT: Published data on the subject are contradictory. The authors investigated the possibility of saturating iron and steel with tin and antimony and the corrosion-resistance of such diffusion layers. Specimens of 10 mm diameter, 5 mm high were saturated in vacuum ($2 - 5 \times 10^{-2}$ mm Hg) by evaporation of tin and antimony powder. The investigations were carried out on commercial iron and on steel 20, 45, У8 (U8) and У12 (U12). The results of saturation of commercial iron indicate that the concentration of tin on the surface of the specimen increases slowly with increasing temperature of the process. However, the quantity of absorbed tin, the depth of the diffusion layer and the volume of the specimen increase rapidly with increasing temperature of the saturation process.

Card 1/6

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The Effects of Dispersion of Graphite and Heat Treatment on the Mechanical Properties of Cast Iron Under an All-Round Uneven Pressure

iron showed graphite in lamellar form, evenly spread over the surface. The 10 and 15 mm diameter specimens contained small quantities of structurally-free cementite and perlite matrixes. The 20 mm specimen had a perlite structure and the 30 mm specimen contained about 5% of ferrite. The 30 minute-long heating up to 950°C for hardening or normalization, was made in a barium-chloride bath. The cooling was done in 20°C water. Experiments showed, that reducing the size of graphite increases the value of the stresses ; causing equal deformations. Heat treatment is most effective with cast iron containing fine graphite. There are 3 graphs, 2 tables and 3 Soviet references.

ASSOCIATION: Nikolayevskiy sudostroitel'nyy institut (Nikolayev Shipbuilding Institute)

PRESENTED: July 30, 1958, by V.N. Svechnikov, Member of the AS UkrSSR

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031500037-6

SOV/21-59-3-13/27

AUTHORS: Titov, V.K., and Makarov, Ye.F.

TITLE: The Effects of Graphite Distribution and Heat Treatment on the Mechanical Properties of Cast Iron Under an All-Round Uneven Pressure (Vliyanie razmerov grafita i termicheskoy obrabotki na mekhanicheskiye svoystva serogo chuguna v usloviyakh vsestoronnego neravnomernogo szhatiya)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1959, Nr 3, pp 286-289 (USSR)

ABSTRACT: Using the method of academician B.D. Grozin [Ref 1], the authors studied the effects of the dispersity of graphite and heat treatment on the mechanical properties of cast iron under conditions of soft loading, that imitated the practical contact application of loads. Experiments were made on 10, 15, 20 and 30 mm in diameter cast iron cylinders cast in the ground. They consisted of 3.35% C, 1.80% Si, 0.48% Mn, 0.120% P, 0.185% S, and had a hardness of 101, 100, 95 and 90 units. Microstructurally, cast

Card 1/2

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